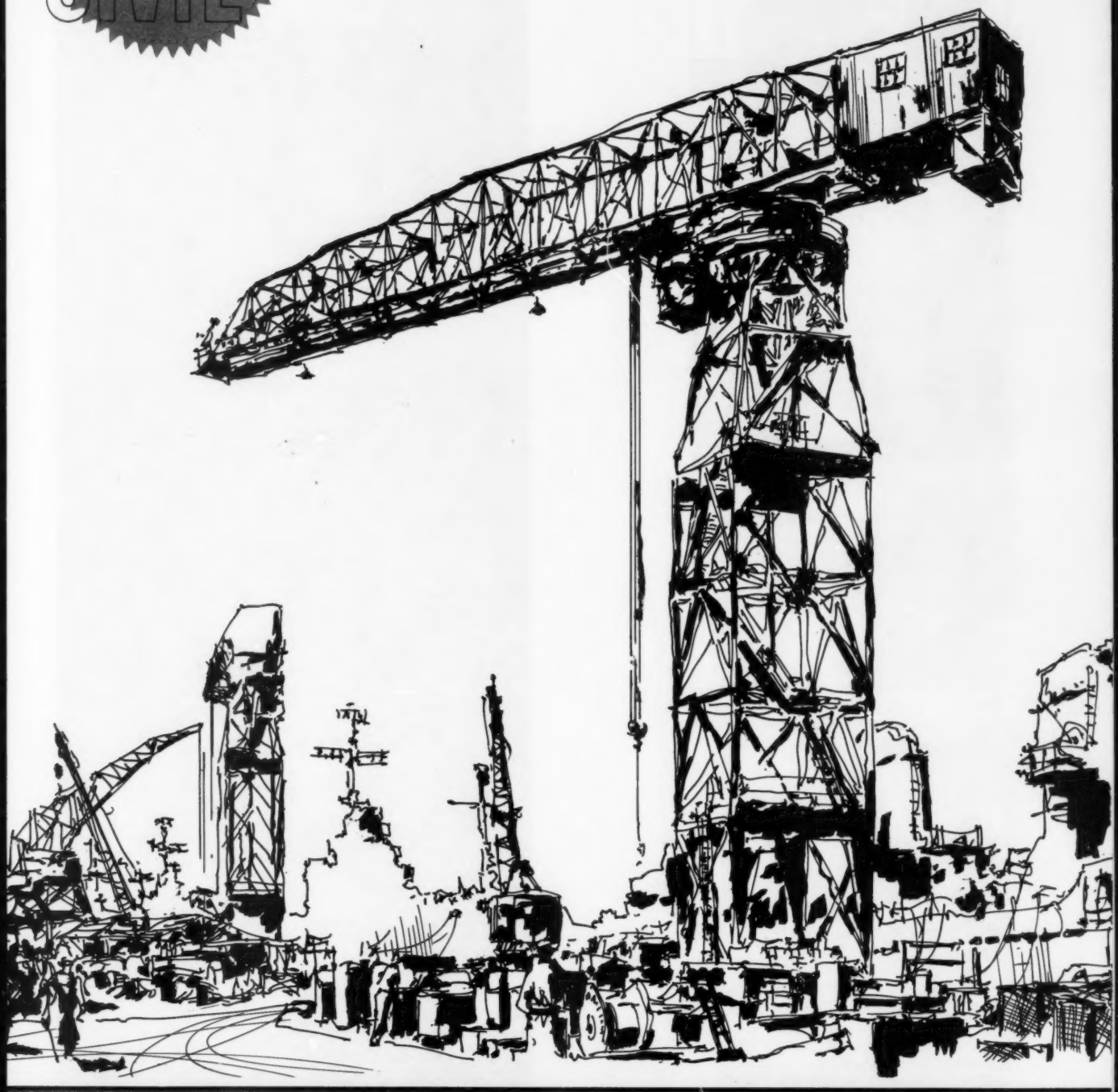
# NAVY CIVIL ENGINEER

SPRING 1978



Massive oil spills at sea spell disastrous results on the shoreline and minor oil leakage from industrial activity near a waterfront can pollute nearby waterways and harbors. The Atlantic Division, Naval Facilities Engineering Command, recently concluded a detailed study of oil spillage confronting the Norfolk, Va., naval complex. The details begin on page 4. And the Commander of the Atlantic Division, RADM C.C. Heid, expresses his view of personnel management on page 30 in "Speaking From Topside".

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**DONALD G. ISELIN**
Rear Admiral, CEC, U.S. Navy
Chief of Civil Engineers
Commander, Naval Facilities
Engineering Command

**KENNETH P. SEARS**
Rear Admiral, CEC, U.S. Navy
Deputy Chief of Civil Engineers
Vice Commander, Naval Facilities
Engineering Command

**HAROLD WELSH**
Editor

**BILLYE NEWLEE**
Editorial Associate

**BILL BRACK**
Contributing Artist

**W. C. C. JOHNSON**
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NAVFAC HQ

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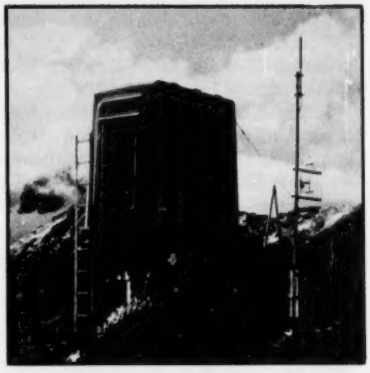
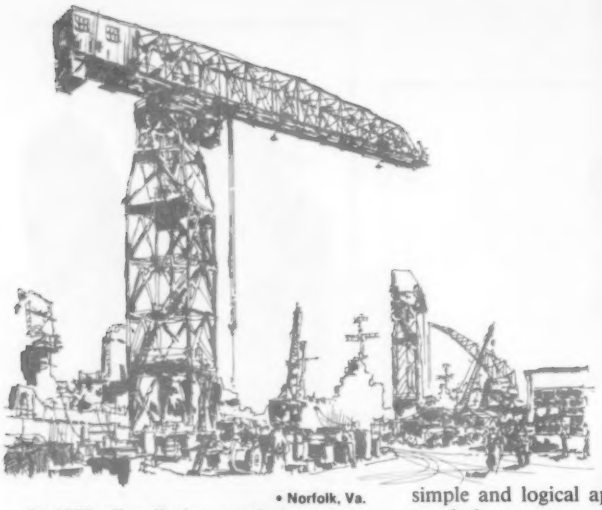


RTG—THE RADIOISOTOPE THERMOELECTRIC GENERATOR AND ONE EXAMPLE OF ITS CURRENT USE IS DISCUSSED BY AUTHORS VOGT AND MORRISON BEGINNING ON PAGE 9.

BLUE AND GOLD TEAM CONCEPT AND OPERATIONS OF NAVAL MOBILE CONSTRUCTION BATTALION 3, ON LOCATION IN THE FAR EAST, IS DESCRIBED BY THE BATTALION'S COMMANDING OFFICER ON PAGE 15.

# Oil spillage



• Norfolk, Va.

By E.T. CONRAD,
JAMES J. WALSH
*SCS Engineers*
*and*
J.R. LANCASTER
*Environmental Engineer, LANTDIV*

In 1973 oil pollution regulations were promulgated by the Environmental Protection Agency (EPA) and the U.S. Coast Guard. The objective of these control measures was to prevent oil spills; to control accidental spills; and to promptly contain and clean up such spills.

Prior to 1973, the U.S. Navy had worked to prevent oil pollution. However, after the new Federal regulations were published, the Navy established a specific and financed program to comply with these measures. Since that time, progress has been made in constructing improvements, modifying operations, and preparing plans to combat potential problems.

A number of oil pollution problems, however, required a more comprehensive program to identify oil pollution deficiencies; recommend corrective projects; and prepare the appropriate funding documents. The new study was conceived by the Naval Facilities Engineering Command (NAVFAC) and projected by three of its field divisions who selected *SCS Engineers* to perform the study for the activities under the division's respective jurisdictions.

The *SCS* study surveys and reports for the Atlantic Division are the subject of this report. The 18 activities within this division are mostly located within the vast Naval complex of Norfolk, Va.

The purpose of the study was to examine oil storage, oil transfer, and oily waste generating facilities for compliance with pertinent EPA, Coast Guard, and Navy regulations.

Oil spill contingency plans at each activity were also reviewed for regulation compliance.

A "Criteria for Oil Pollution Prevention, Control, and Containment Facilities" was then drafted based on a simple and logical application of these regulations, tempered by engineering judgment.

The primary premise of the Criteria was to keep oil separated from water (i.e., to eliminate the mixing of oil and water). Every effort was made to provide oil containment at the source rather than separation of oil from water downstream from the source.

The secondary premise was to provide relatively simple, low maintenance improvements rather than sophisticated capital-intensive equipment. Ultimately such sophisticated equipment may require considerable maintenance.

Thus, the operational and human control factors figured heavily in the development of the Criteria.

After its initial drafting, the Criteria was reviewed by the Atlantic Division and NAVFAC Headquarters for technical comments and funding considerations. Comments received from these offices and experience gained on earlier surveys were used to revise and refine the Criteria.

Surveys were performed on each activity by an experienced SCS field team accompanied by the Atlantic Division project officer who is responsible for oil pollution control. The field team was also accompanied by personnel of the activity such as fuel supply officers, maintenance supervisors, and public works and engineering department representatives.

Draft reports were prepared summarizing the survey findings and the recommended improvements for each activity. As previously described, the Criteria was used to form the recommendations. The draft report was informally reviewed by the Atlantic Division Project Officer. Thereafter the report was sent to the activity personnel for review and comments.

Briefings were made to management and technical personnel at each activity providing an opportunity to inform management as to what was done and why, and to develop greater support to the recommended improvements. Final reports were prepared after the briefings and receipt of comments from all interested parties.

The Criteria was used as a guide in making recommendations to correct oil facility deficiencies. Some of the major criteria warrant further discussion.

Storage tanks that are seeping their product should be effectively sealed. This recommendation was made for most aboveground riveted-steel tanks and most underground concrete tanks.

Most above ground riveted-steel tanks were originally constructed to store Navy Special or other heavy fuels. These tanks are now storing lighter petroleum products, such as jet fuels and diesel marine fuel (DFM). During the field survey, it was observed that the product was seeping through the seams of most riveted steel tanks at the base of tank sidewalls. The seepage which has continued for years has resulted in the oily saturation of the soil surrounding. (Illustrated in Photo 1.) According to federal regulation, a leak resulting in the visible product loss from tank seams and sufficiently large to cause oil accumulations on the ground should be promptly corrected. Accordingly, it was recommended that virtually all aboveground riveted-steel bulk storage tanks be effectively sealed to prevent further loss of the product through tank sidewalls.

Most underground concrete tanks were also originally constructed for heavier fuel products, such as Navy Special. However, these tanks are not effective at holding DFM and jet fuels which are lighter fuel oils. Therefore, these tanks

# preventing surface contamination at Norfolk

have to be effectively sealed to prevent loss of product or the intrusion of groundwater.

Adequate secondary containment should be provided for all aboveground tanks 2,500 liters (660 gallons) or larger. The contained area should be large enough to contain the volume of the tank plus enough freeboard to contain the maximum one-day rainfall.

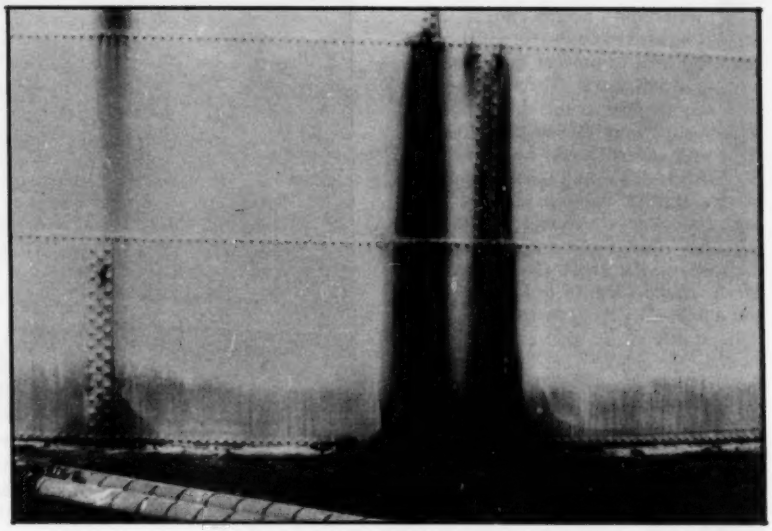
Normally, for smaller horizontal cylindrical tanks, a concrete slab with retaining wall can be constructed around the tank. (Photo 2 illustrates a tank for which this type of containment was recommended.) For larger tanks and bulk storage tanks, the secondary containment structure is normally an earthen berm.

Enclosed containment areas around aboveground tanks should be graded to drain away from tank perimeters toward drainage inlets. Enclosed areas and interior berm sidewalls should be paved with asphalt when the native earth is relatively permeable. Paving of the enclosed area with asphalt was recommended for containment areas at most of the Norfolk area activities surveyed because of the sandy loam at these locations which is relatively permeable.

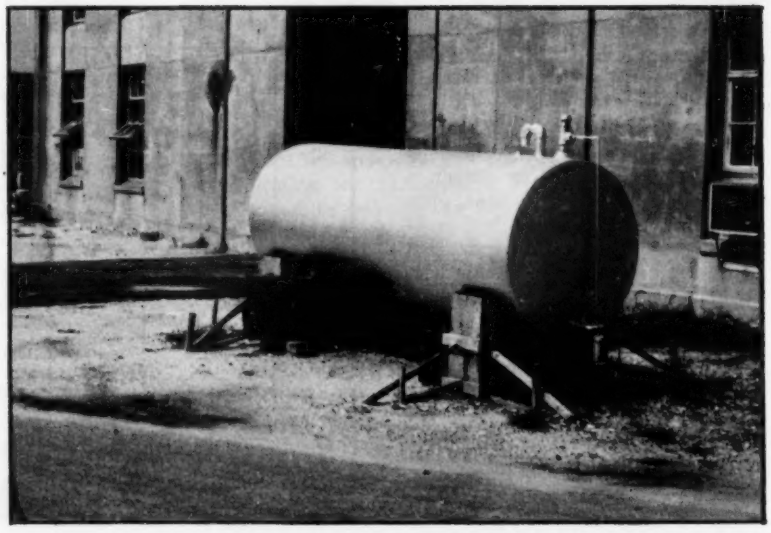
Storm drainage inlets and pipes through secondary containments should be installed. Valves should be installed on discharge pipes to contain oil spillage and to control the rate of discharge. Valves should be operable from within the berm and should normally be closed until ready to drain collected stormwater.

Liquid level indicators should be provided for all aboveground storage tanks of 2,500 liter capacity (660 gallons) or larger and all underground tanks 19,000 liters (5,000 gallons) or larger. Readouts for these indicators should be located for easy monitoring by fuel truck personnel at truck unloading stations. At tank farms where loading of tanks is through underground pipelines, readouts (as well as temperature readouts and high level alarms) should be provided at control centers. These measures will reduce the potential of overfilling tanks.

Containment should be installed around the fill ports for underground tanks with capacities of 1,000 gallons or more to collect minor overfills and hose drippings. The size of the containment area is dependent upon the size of the fuel hose with the minimum size to be 61cm (2 ft) square and 15cm (6 in.) deep. *(Turn page please)*



Most riveted steel tanks were originally constructed to store heavy fuels and are not effective in containing the lighter fuels they now store. (Photo 1)



A concrete wall is needed around this tank to provide secondary containment of spilled fuels. (Photo 2)

# Oil spillage

*(Continued from preceding page)*

A watertight hinged metal cover should be affixed to the top of the containment area to prevent the accumulation of storm water. The cover should normally be kept in the closed position and opened only during tank loading. Cast iron covers should be provided at MOGAS and AVGAS tanks; aluminum covers should be provided at JP-4 tanks; steel covers should be provided at all high-flash fuel storage tanks.

In non-traffic areas, the containment can be raised 15cm (6 in.) above grade and a light-duty cover installed.

In traffic areas such as at service stations, the containment can be recessed into the pavement and a heavy-duty cover installed. (A fill port located in a non-traffic area and requiring such containment is shown in Photo 3. Proposed containments for fill ports in both traffic and non-traffic areas are detailed in Figure 1.)

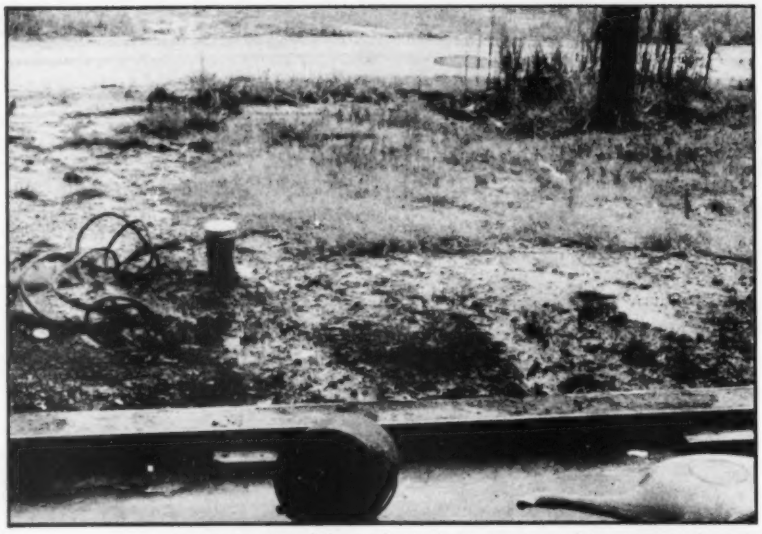
Most bulk storage tanks are regularly subjected to water draw-off or tank stripping operations. Recommendations for these operations are:

First, a sight glass should be installed on the existing water draw-off line as close to the tank shell as possible. The sight glass will enable the operator to more readily determine when the product enters the draw-off line and reduce the amount of the product discharged into the storm drainage system. Second, the oil fraction should be manually segregated from the water fraction by the operator for disposal in an environmentally acceptable manner. Third, the water fraction from these tank stripping operations should be piped or transported to oil/water separators before discharge of the treated effluent to watercourses. (The installation of a typical sight glass is demonstrated in Figure 2.)

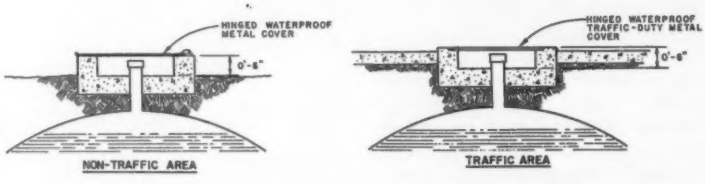
Portions of fueling piers having unloading facilities should have containment curbing adequate to contain a spill resulting from a leaky hose, open valve, or ruptured fuel line. Portions of fueling piers acting as causeways and supporting only fuel transmission lines do not normally need containment curbing.

Containment of spills on piers should be ensured by providing wooden plugs chained to deck for all drain holes; elastomeric seals for all expansion joints; rolled curbs at entrances to fueling piers (or pierheads); and watertight containment around fuel risers from

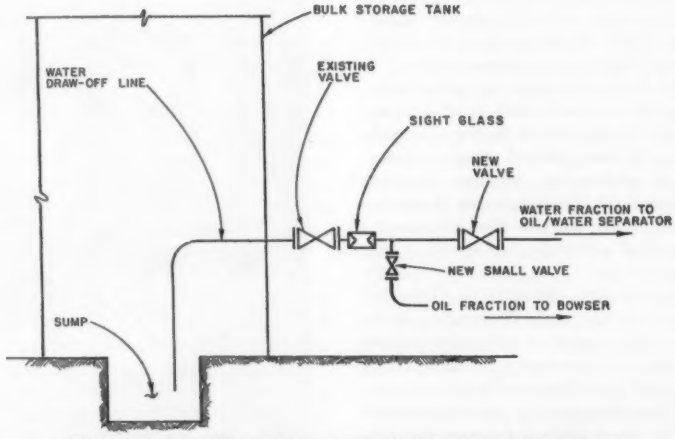
*(Continued on page 22)*



**A concrete slab and containment curbing topped with a metal cover should be constructed around the fill port for this underground tank to contain drippings and minor spills. (Photo 3)**




**Typical underground tank fill ports. (Figure 1)**




**Water draw-off system with sight glass. (Figure 2)**

# Future management philosophies

By M. C. KOBLOS
*Program Analyst*
*Command Program Coordinator*
•Alexandria, Va.

The turbulent '60s picked up the dice of our customs, mores, attitudes and values, shook them soundly in the cup, and spilled them back out onto the fabric of society. When they came to rest they spelled out "everything is everybody's business."

The consequences of that declaration soon made themselves manifest. Women burned their bras and fled the hearth and their traditional roles. Little old ladies lay down in the path of bulldozers to prevent the desecration of virgin forest. College students rebelled against a war that was demanding their particpation, by questioning the morality of its purposes. School children demanded more of a voice in what they were to be taught and how they were to comport themselves. Up with sexual freedom; down with cholesterol; stop nuclear power plants; start jogging; leave furs on the animals; join a car pool; stop The Establishment. Involvement was the name of the game.

The quiet carpeted halls of management did not escape attention. Management became everybody's business, and everybody's business demanded everybody's involvement. Management philosophies had to change to meet this new reality. Procedures had to be developed to accommodate its demands. And participation by all in management's affairs became an accepted way of corporate life.

A new openness seemed to come about, and thus, communications took on a new meaning and importance. Since everyone was part of management, all had to learn to communicate with one another to the extent necessary to ultimately reach understanding, and hopefully, agreement.

Deciding became decision-making, and what was once an act of one individual became a process involving many. The decision-making process involved virtually all organizational levels, each contributing to the development of the ultimate resolution of issues. At the end of the process the sole executive gave way to the board, and unilateral decision was replaced by general consensus as a more acceptable and equitable way to determine things.

Participation became the inoculation against the possibility of dissent, and thus participative management was born, to minimize, if not obviate employee unrest. Unions sat with management, mutually resolving matters which were, once the sole province of management. First-line supervisors, assisted in the development of production estimates by their workers, were much better able to discuss production quotas with superiors, and therefore lend their support more willingly to reach the targets eventually set. Thus participation was not only an inoculation against dissent but also a catalyst for support.

The next logical step took its form in the concept of MBO—management by objectives. Objectives, mutually arrived at by all parties concerned, could not help but enjoy their mutual support. It allowed each member of an organization to clearly understand exactly what it was that they were collectively committed to achieve, and therefore better identify what each must individually contribute to make that achievement possible.

MBO was not created to fill a need, but rather, was a natural development of the times, as are most management concepts and philosophies. Management is not a trailblazer. It is basically a great compromiser. As long as production (achievement) can continue it will submit itself to almost any kind of philosophical or structural configuration necessary to actually, or apparently, maintain its compatibility with the social condition prevailing at the time. In short, at any point in history, management is where it is because society is where it is.

Thus, to know what is next after MBO, we must look to society, and attempt to discern the direction in which it is headed. This is, of course, not an easy matter. Society is much like a flock of migrating birds, whose progress north or south is a product of wheeling turns and roundabouts, which when viewed from the ground appear chaotic.

There are indications that the cry of the '60s, that "everything is everybody's business" may give way in the '80s to the concept of "everything is everybody's responsibility." If this should occur, "management by objectives" could change to "management by collaboration," since there would be no need for objectives to assure support when success depended only upon parties, already accountable to a common cause, to act in concert. Even supervision, in our current context, could become redundant.

On the other hand, society might turn about and reject further involvement, or collective responsibility, and seek a strong central authority which would relieve the individual, and thus society, of its self-assumed burdens.

One thing certain, society will continue to change, and management philosophies, concepts, and practices will continue to accommodate the demands thus generated... it *has* to in order to survive.

# chalk another one up for nuclear!

By LTJG WILLIAM A. MORRISON, CEC, USNR
*RTG Dept.*
*Naval Nuclear Power Unit*
*E.I.T., Kans.*

•Port Hueneme, Calif.

The risks of nuclear power generation readily make the headlines, so it is refreshing to hear of one instance where application of nuclear technology has made life safer. A case in point—the recently completed Lake Clark Pass Project, a joint effort of the Naval Nuclear Power Unit (NAVNUPWRU) and the Federal Aviation Administration (FAA), which involved the establishment of an air-to-ground communications network in a remote pass of Alaska.

The area is located approximately 100 miles southwest of Anchorage and 60 miles west of Kenai in the Aleutian Mountain Range. This narrow passage is heavily utilized by light aircraft flying under VFR (visual flight reguations) to gain access to the prime fishing and trophy hunting areas located on the Alaska Peninsula and in the Yukon-Kuskokwim River delta.

Previous to the project, lack of communications prevented pilots from obtaining vital weather information through the total length of the pass. The FAA had operated three self-sustained outlets (SSOs) or repeater stations powered by propane-fired thermoelectrics. These SSOs provided air-to-ground capability from the approximate midpoint of the pass back to the Kenai Airport Flight Service Station (FSS).

A need for complete radio coverage was evident to those traversing the route. It was not uncommon for one to enter the pass under ideal conditions and unexpectedly encounter near-zero visibility with insufficient time and space to turn around. The object of this project was to remedy this dangerous situation by installing four new SSOs powered by radioisotope thermoelectric generators (RTGs) and replace one of the older propane thermoelectrics by an RTG. Plans call for the replacement of the remaining two propane units, which is dictated by their performance history and increased costs of maintenance and fuel.

Each SSO is composed of radio equipment, antennas, power source, and a shelter. The radio equipment is enclosed in an insulated fiberglass shelter mounted on an elevated platform directly above the RTG. When the SSO is in the idle or "listening" mode, its power source, consisting of an RTG and power conditioner, supplies energy to run the radio equipment and to charge nickel-cadmium (NiCd) batteries. In the keyed mode, i.e., when a transmission is received and the SSO transmitter is activated (keyed), the additional power requirement is satisfied by the NiCd batteries.

The SSOs in combination make up the complete radio network or link. When an aircraft in the pass broadcasts a message, the nearest repeater is keyed and in turn retransmits the information to the next SSO in line. This process is repeated down the link until Kenai FSS receives the message. A similar course of events occurs when Kenai broadcasts outbound on the link. Detailed engineering by the FAA and NAVNUPWRU was required. To use the RTGs, FAA was required to obtain a radioactive materials license from the Nuclear Regulatory Commission. With the aid of the Radiological Affairs Support Office, a department of NAVNUPWRU, this was accomplished without difficulty.

Next, power conditioner units (PCUs), which match RTG electrical characteristics to SSO power requirements, had to be designed, built, and tested. After many modifications and adjustments, testing indicated that these PCUs were somewhat unsatisfactory. To allow time for redesign and building of new units, older, more proven ones were altered and substituted in their place. While this work was proceeding, NAVNUPWRU conducted NiCd battery performance evaluations. The object was to determine the amount of transmission time per day allowable without causing continual discharge. Also of interest was the quantitative effect of Arctic low temperatures on NiCd charge-discharge characteristics. Expected ambient conditions, SSO duty cycles, and RTG electrical outputs were duplicated. The batteries were charged and discharged simulating actual system operation.

Results indicated that radio equipment power requirements would have to be reduced and that the batteries would have to be insulated from the extreme Arctic cold if appreciable transmission times were desired. Both of these issues were handled by FAA engineers. Finally, the RTGs were transported by a Military Aircraft Command C-130 from their storage area at Naval Air Station, Point Mugu, Calif., to Kenai Municipal Airport, Alaska. After final integration testing of the generators and radio equipment, all was airlifted by commercial helicopter to Lake Clark Pass. Final helicopter operations and equipment hookup was accomplished in snow and 40-knot winds.

For all those involved, the project was immensely challenging and the results satisfying. Those who now fly through this beautiful, remote area of Alaska can feel more secure in that if trouble strikes, help is as close as their radio.

# RADIOISOTOPE THERMOELECTRIC GENERATORS

**By LT JOHN F. VOGT, CEC, USN**
*Director, RTG Dept.*
*Naval Nuclear Power Unit*
*E.I.T., S.C.*

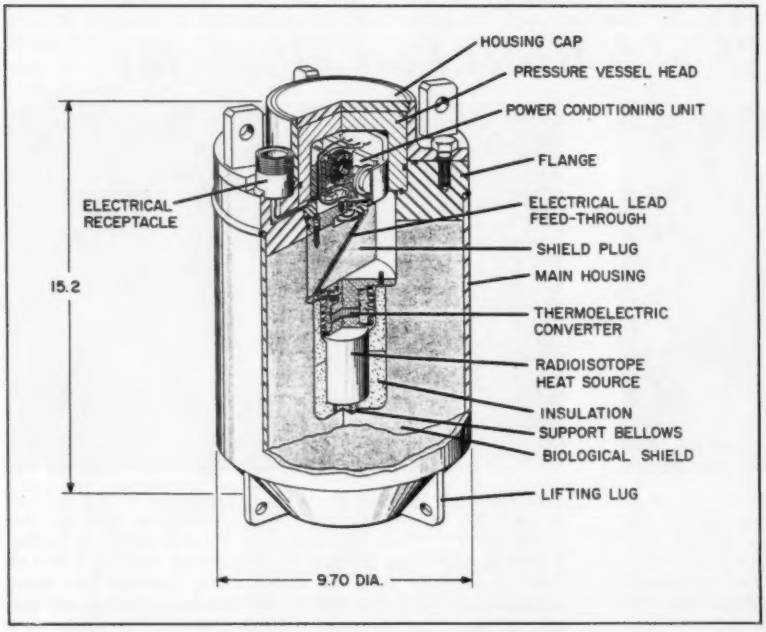
•Port Hueneme, Calif.

Nuclear energy usually calls to mind large concrete-domed reactors capable of generating hundreds of megawatts of electrical power for the utility industry. In the last 20 years, however, the atom has been put to a much more modest use in a type of electrical power source known as a radioisotope thermoelectric generator (RTG).

These devices typically generate a relatively small amount of power—from fractions of a watt to several hundred watts. In this power range, these devices have an interesting and unique advantage over other power sources: they can be designed to operate continuously for periods of time in excess of 10 years without surveillance or an external energy source. Thus there is no need for such things as fossil fuels, umbilicals, power lines, or even routine maintenance.

A radioisotope thermoelectric generator basically consists of five components: an encapsulated radioisotope heat source, thermal insulation, thermoelectric converter, a power conditioning unit, and a biological radiation shield. The physical arrangement of these components is illustrated in a cross section of typical deep-ocean RTG.

Thermal energy generated within the heat source by decay particles colliding with the isotope material is transformed into low-voltage DC electrical power by the thermoelectric converter. A schematic diagram of the RTG components shows the detailed interconnection of *n* and *p*-type semiconductor thermoelements within the thermoelectric converter. Thermal losses are reduced by employing insulation to channel the heat flow through the thermoelements.




Radiation originating in the heat source from the radioactive decay process usually requires the provision of a biological shield for personnel protection. The low voltage produced by the thermoelectric converter is normally transformed to a higher potential by power conditioning equipment in order to match the power requirement of the electrical load.

The principal radioisotope fuels used in RTGs are Strontium-90 and Plutonium-238. Differences in their radiation, half-lives, and cost result in significant differences in their application. Plutonium-238 has been used extensively in space applications because of its relatively longer half-life (86.4 years versus 27.7 years), its minimum shielding requirements, and consequent light generator weight. Because of its long half-life and radiation characteristics, Plutonium-238 is also used in biomedical applications such as the miniature nuclear batteries in heart pacemakers. Strontium-90, because it can be obtained more economically, is used in terrestrial applications even though heavy shielding is required due to *bremsstrahlung* (braking radiation) production.

Many advantages can accrue through the use of RTGs in lieu of conventional power generating devices when special requirements arise. RTGs provide reliable long-term unattended operation ideal for remote or inaccessible areas such as outer or dark space,

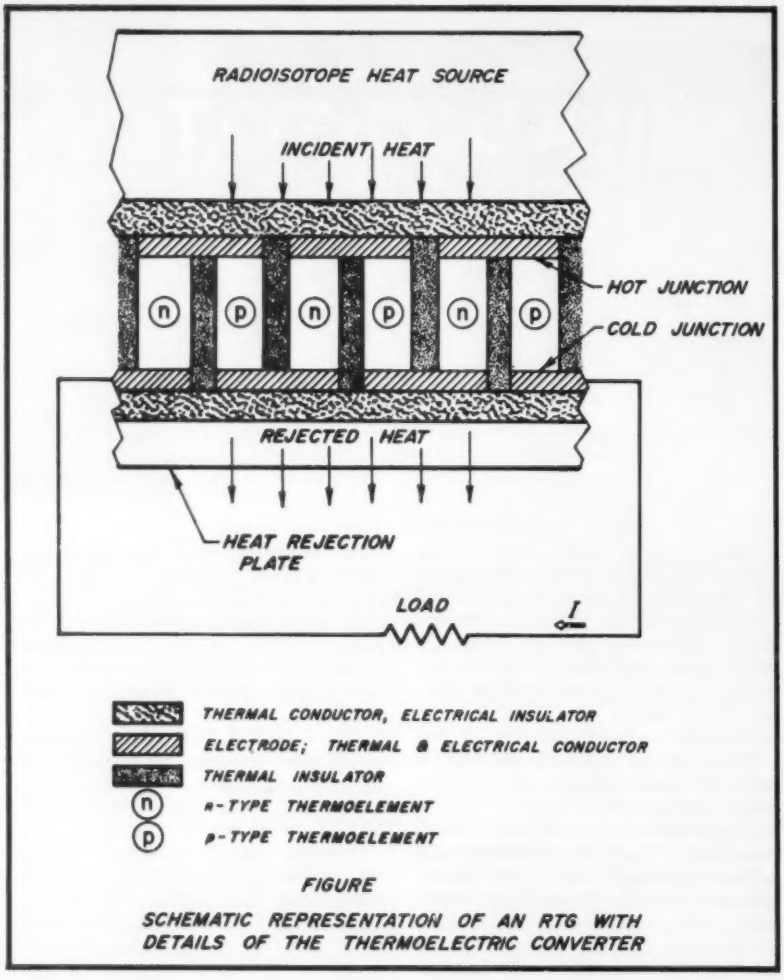
*(Continued next page)*

the ocean floor, the Arctic and Antarctic regions, and the interior of the human body. Their use frees the designer from the constraints normally imposed by the limited availability of electrical power lines, the limited life of chemical batteries and other similar energy storage devices and the limited availability of sunlight for photovoltaics.

Radioisotope thermoelectric generators have proven to be ideal for many applications. The SNAP (Systems for Nuclear Auxiliary Power) series of RTGs is being used extensively to power navigational and weather satellites, deep space probes such as the two Viking Landers which rest on Mars, and scientific equipment such as the Apollo Lunar Surface Experiment Package which remained on the moon. Terrestrial applications such as remote weather facilities in the Antarctic region or isolated UHF repeater stations are also well suited projects for the maintenance-free RTG *(see preceding article "Chalk Another One Up for Nuclear").*

Other terrestrial uses include powering navigational buoys, meteorological or oceanographic data collection systems, and undersea surveillance systems.

*For more information concerning the uses of a radioisotope thermoelectric generator, contact LT John F. Vogt or Ken Pinckney at the Naval Nuclear Power Unit, Port Hueneme, CA, AUTOVON 360-4161 or Commerical (805) 982-4161.*




FIGURE

SCHEMATIC REPRESENTATION OF AN RTG WITH DETAILS OF THE THERMOELECTRIC CONVERTER

# *USS Marvin Shields Visits Port Hueneme*

MEMENTOS OF THE VISIT, plaques of their respective commands, are exchanged by CDR Keeley of the *USS Marvin Shields* and Capt. R.E. Quinn, Jr., CEC, USN, executive officer of CBC, Port Hueneme, Calif. The destroyer escort was commissioned in 1971 and named after Constructionman 3rd Class Marvin Shields of Seabee Team 1104 who was posthumously awarded the Congressional Medal of Honor for his conspicuous gallantry at Dong Xoai, Vietnam in June 1965. Shields was homeported at CBC, Port Hueneme.

PORTRAIT OF MARVIN SHIELDS is presented to the skipper of the *U.S.S. Marvin Shields,* CDR Joseph Keeley, USN, (left) by LCDR D.N. Hull, CEC, USN, executive officer of the Naval School, Civil Engineer Corps Officers (CECOS) during the ship's visit to the Construction Battalion Center. The portrait had been accomplished by a former CECOS staff member, Robert A. Camuso, now of New York City, for a 1966 cover of *The Navy Civil Engineer* honoring the Seabee hero.

*More about*

# *Staff Civil Engineers*

**By CDR GORDON W. CALLENDER, CEC, USN P.E., La.**
*Executive Officer, PWC, Pensacola*

In an excellent and stimulating article in the winter 1977-78 issue of the *Navy Civil Engineer* LCDR C. S. Prahl portrayed the plight of the SCE. The article left me feeling that the SCE concept is ill defined; has problems, but works; and needs improvement.

The purpose of my reply is not to criticize his excellent article but rather to offer some additional thoughts and from a different perspective.

*The 1969 OPNAV Note.* This notice, long self-canceled, established the concept of the SCE. Why hasn't it ever been reenergized? Frankly, I don't know. I do know something about the *year* in which it was signed. Without considering the Corps as a whole just recall the SEABEES in 1969—20 plus battalions moving in and out of Vietnam, building a reputation as remarkable as those of World War II. Then remember the Corps—9 admirals and 2000 plus officers. It adds up to something that in recent years newscasters tell us has been lost by a number of elder Southern Congressmen. The "clout" that NAVFAC wielded in 1969 must have been well above that of the pre-Vietnam era not to say that of the present. Not only is the Corps below pre-war staffing levels, we are below zero base levels.

What all this is pointed toward is a question—under current conditions could NAVFAC "sell" OPNAV any document formalizing the SCE concept that would be of any value in the eyes of the junior officer who is the SCE? Recent news magazines portray the Navy's problems with shipbuilding contracts and the status of our huge and fabulously expensive carriers. Clearly, OPNAV is emersed in greater dilemmas than the concept of the SCE. LCDR Prahl mentions the possibility of a holy war with the Line. I submit that the Corps definitely should steer clear of a *jihad*. This type of infighting does no one any good and is definitely not in the interest of our real job—national defense.

*Why does the SCE concept work?* Despite the lack of Navy-wide guidance on the SCE concept it does work in varying degrees. On the surface this finding is surprising. It works for a number of reasons. The four reasons I list below are drawn from my knowledge of only one center (a limitation that is unfortunate); however, centers are managed under a corporate concept so many things have a way of being similar, and in any case all of these reasons deal with people.

• First, take the CO (the Mr. Outside of the PWC CO/XO team). A quick check of COs will point out who gets these jobs. The officers selected to be center COs are among the best the Corps has. Even if they were junior officers before anyone heard of a SCE they are flexible, experienced and very likely to empathize with the SCE—provided the SCE has access to them. Yes, let's keep the SCE with the additional duty as an activity civil engineer (ACE). The PWC CO has the horizontal contact with the SCE's CO that can produce the answer to many dilemmas the SCE may have. Thanks to the calibre of officers who fill SCE billets it won't be every problem the SCE faces that he will have to seek help on from the center CO.

• Another mentor/confidant for the SCE is the senior ACE (yes, let's keep the SCE . . .). Here is where the SCE can plug-in for that extra center effort necessary to get the job done or where the idea that wasn't appropriate to toss at the SCE's clerk typist can be tested.

• Third, consider the detailers. Like the COs of PWCs a quick check of past detailers tells you a lot about the quality of individuals selected to be detailers. Considering the plethora of regulations and restrictions that they must consider and still get the job done it's a real tribute to their ability that SCE jobs get filled as adequately as they do. Few of us non-detailers could do any better with the personnel juggling act than they do.

• Having mentioned the adequate manner in which SCE jobs do get filled brings me to the subject of the quality of the young officers I have had the pleasure of knowing in their SCE/ACE roles: my fourth reason why the SCE concept works!

As an example, take the SCE at the Naval Hospital (LCDR Prahl's example) who worked for a LCDR, who worked for a captain who worked for the XO who worked for the CO. Considering the echelon of this command you might guess the CO was a Rear Admiral. Thus the distance away from the CO was a little more understandable. In fact, this SCE has significant influence in the whole facilities program for this hospital. In addition, even though seemingly far removed from this CO, the SCE has direct access to him on a regular basis. Finally, because of a reorganization in January 1978 the GS-12 engineer mentioned works for the SCE. My point in going over these items is that what may sound awful from the standpoint of access to the CO may prove to be more than adequate both functionally and in terms of reward for the SCE. The success of this particular relationship resulted from the fact that the two officers who have most recently filled the billet have been capable organizers and managers, typical of the young officers who are detailed to SCE billets.

*Is the effort to institutionalize the SCE concept with a new OPNAV document worth the result or the risk?*

Consider the picture LCDR Prahl paints and how we might retouch it: The SCE has to serve two masters (because of his ACE hat); he frequently

*(continued next page)*

*(Continued from preceding page)*
lacks prior experience in public works matters; and both he and his primary duty boss need OPNAV guidance in how he should be used. From a review of my tally sheet I'd call the ball game like this:

Retain the ADDU duty as an ACE; the plusses far outweigh the minuses.

It is unrealistic that every SCE job get an officer with 18 months public works experience or four years in the CEC, or a LT (or above). Why not let the detailers do their best to continue to place exceptional young officers in SCE jobs? After all, the SCE concept is working and most SCEs find their job rewarding. I submit the detailers and the Corps probably have other problems and don't need such inflexibility as the limits described above could impose.

In the military service the CO is the ultimate manager. He needs flexibility. The SCE needs room to exercise initiative and judgment. Centralized control and standardization on a world wide scale is great for many things, but I submit the Corps needs to be very careful in how it is applied to the SCE concept. Furthermore, we do not need the threat of a *jihad*.

In summary, our Corps is small and, like another famous Corps, (whose regiments sing of Montezuma and Tripoli), elite. As a result we get top young people into our ranks. Those who make it to captain under current staffing levels have survived a rugged competition. When one considers that the SCEs, detailers and PWC COs are the tops of what is already a select group it becomes apparent that we may not be able to do too much better.

All in all it seems to me the SCE concept, currently functional in many ways in many places, rewarding to most officers who are SCEs, has a net positive score and deserves long and serious consideration before it is rigidly remolded into a tight neat little institutionalized package.

Finally, a public commendation to 'Kip' Prahl for candidly discussing a sensitive subject.

# *SCEs or PWOs?*

**By LCDR RICHARD H. RICE, JR.**
**CEC, USN**
**PE, Hawaii**

• Alameda, Calif.

With regard to *Staff Civil Engineers* I would make two points—there should be more of them and they should be called *Public Works Officers.*

The "Dillon Board" in 1968 made several key recommendations pertaining to Staff Civil Engineers (SCEs) and Activity Civil Engineers (ACEs) and I quote:

"The merging of command and support calls for a re-examination of the staffing of PWCs with ACEs . . . With commands being responsible for obtaining their own support, with increased fund flow through command, many commands have expressed a need for Staff Civil Engineer on their rolls. Such an assignment would replace the ACEs and should enable the command to develop better execution plans (to the benefit of the centers) and would result in greater command confidence. Thus, the Board concludes that the concept of ACEs should be revised and that some officers should have primary duty as Civil Engineers on the staffs of the major supported commands."

The CEC Zero Base Study recommended that the SCEs be assigned to more activities served by PWCs and that the number of ACE billets be reduced accordingly. Specifically, the Zero Base Study recommended ACE staffing for the 9 PWCs of a total of 34 officers: 9 Lieutenant Commanders, 18 Lieutenants, and 7 CWO 3/4. The P-1 of Summer 1977 indicates 45 officers (8 LCDR, 20 LT, 8 LTJG, 8 Ens, 1 WO2) billets are presently identified as ACEs or 33% more than the Zero Base Study. It is apparent that the recommendations of the Dillon and Zero Base Studies have not been adopted!

Another concern discussed in the Zero Base Study was that Staff Civil Engineers should increase emphasis on planning. The key to future success in Real Property Maintenance Activity (RPMA) funding is getting your oar in early. Planning must be done at the activity level so that OP-44 will have the input for the Program Objectives Memorandum (POM) budget drill.

How many ACEs are involved in activity level RPMA planning—how many know what a Facilities Management Budget Exhibit contains? How many are knowledgeable of recent changes in AIS format—and that BEMM is "out" and BMAR Category I nondeferrable is "in"? The maintenance of the activity in FY-80 depends on today's input.

Lest we members of the ever shrinking CEC forget, RADM Dillon in his 1968 report stated, "Corps image can be described as our service reputation, or how we corporately appear to others—or how we think we appear to others."

The COs and XOs of the operating forces we serve know our Corps as Public Works Officers—and we have established a reputation over the 100 plus years of our existence as being *the* source of shore support. When a ship in port or activity department head has a problem, he can rely on the old adage "Call Public Works."

How many line officers, especially those who have spent most of their careers at sea, have ever heard of the Staff Civil Engineer—or the Facilities Management Office? In fact, many activity COs with SCEs assigned introduce their officers as "my Public Works Officer."

There is no need to create a new SCEMS (Staff Civil Engineer Management System). If an activity has RPMA bucks they should be managed by a CEC *Public Works Officer.* His or her duties should be codified in a NAVFAC publication (possibly P-318) and as a minimum should include: a requirement to report directly to the CO/XO; guidance on civilian staffing; and a requirement that the PWO budget for and commit RPMA funds.

Heresy, you say—not so. For those who have not looked closely at shore activities lately be advised they are bruised and bloody from vertical cut after vertical cut through regionalization. Not only the old wounds from loss of Public Works, medical, dental, disbursing, communications, data processing, etc., but now IDA (integrated disbursing and accounting) looms to take more out of the comptroller.

The Staff Civil Engineer in many cases now manages the only non-labor dollars around. Why is this any less difficult because he has no blue collar work force? And speaking of that blue collar work force—now that they have been grouped together for efficient operations—the commercial/industrial program is fast shrinking their ranks. At the end of the tunnel will not the CO of the PWC merely be a large Staff Civil Engineer/OICC—what then?

Changing the title of a CEC officer from SCE to PWO may not give him any more experience, or solve the myriad of other problems—but it is a start. If nothing else it will serve as a constant reminder to NAVFAC that their sales force needs and deserves NAVFAC support.

Opinion and Outlook

# Chain of Command

By T.C. MURPHY
*Professor Emeritus, CECOS*

If all the claims attesting to the virtues, properties, and the eternal rectitude of the chain of command (CoC) were laid end to end they would surely circle the globe not once but several times. Much can be claimed for it of course, but like all man-dependent systems it has its limitations and frequent imperfections.

"Any military leader who has not recently done so should spend a few moments in reflection of the value of the chain of command, for it is truly an effective, reliable and utilitarian vehicle of one-way communication," writes Lt. Col. Thomas V. Barham, USA. "Used in this capacity and appreciated for its limitations, the chain of command is probably the most functional tool of organizational communication ever developed. But counted on as a two-way channel, depended upon by a commander at any level to keep him reasonably informed of the ideas, attitudes and adjustments of his lower-ranking troops, it is foredoomed. The commander who uses the CoC exclusively is sentenced to ignorance as far as the attitudes of his men are concerned."

Nowhere is this ignorance more manifest than in the statements which have issued from those high in the CoC regarding military unionization. While the expressions differ according to the individual, these expressions can all be said to be based upon institutionalized assumptions, myth labeled as tradition, relics of elitism, or fear.

One such spokesman states, in all seriousness: "The chain of command is one of two things the serviceman has got going for him. The other is the Congress of the United States."

The vast majority of military people perceive it differently. As a matter of fact they can point to all sorts of evidence which would prove that statement to be precisely 100% wrong—and the opposite to be true.

Army Chief of Staff General Rogers stated before the Stennis Committee recently. "The responsibility to represent our servicemen rests with us senior leaders, uniformed and civilian. Concerned, dedicated, knowledgeable, involved leaders at all levels in the chain of command provide the mechanism through which the needs and concerns of our service personnel can be heard and resolved."

But most service personnel do not believe that their needs are being heard and understood, let alone being resolved. And there is much hard evidence that they are closer to reality than is General Rogers. His claim is more theoretical than true; but his statement fairly exemplifies the doctrinal belief of many of those in the chain of command.

There *is* a well of discontent in the military community and no amount of ritual incantation will blow it away.

Why is the CoC so incapable of transmitting upwards accurate and timely information regarding troop sentiment? Why does this apparatus, which functions so effectively as a command instrument, function so poorly in the matter of upward transmission of grievances, attitudes, aspirations?

Because, first of all, each of the many links in the CoC is a power-holder, whether commissioned or non-commissioned officer. Their relationship with subordinates is naturally a power relationship. And power-holders are by habit, experience, and occupation, poor listeners—no more or less so in military than in industrial organizations.

Consequently, those in the upper levels of the chain of command often receive power-holders' versions of troop sentiments—if they receive anything at all. The commanding officer of the *USS Kittyhawk* was oblivious of the months-old ferment below decks until it erupted. Had he received timely information of the grievances festering among several hundred sailors, the confrontation might well have been averted.

Upward transfer of vital information via the chain of command is often blocked, or sanitized, or distorted. Given the career-critical effect of fitness reports, it may be too much to expect that individuals will faithfully pass upward information which might reflect unfavorably upon their performance, or which might direct attention to areas subject to their authority. Cover up has developed into a fine art, as many of the more candid practioners—corporate as well as military—will tell you.

Further, anti-union bias is firmly embedded in the military power structure. Some of the more conservative would welcome a return to Haymarket methods replete with Pinkertons and the yellow-dog contract. This mindset asserts unionism to be the work of the devil, leading us all to our ruin; shades of 1890.

But even more critical, as they see it, is the spectre of third-party intervention in military matters.

There exists, in the CoC, a passion for control—unilateral control—of all military matters. This is natural. Control *is* vital and it *is* absolutely necessary to military effectiveness, and the quest for it is constant and understandable. For that we should be thankful.

But compensation—pay and benefits—is not a military matter. It is a social-economic matter and most of those in the CoC are poorly equipped to deal with it, ideologically or practically. This is not to their discredit; there is nothing in their training to suggest that they should be so equipped. So it is no wonder that troop sentiment, motivations, aspirations are often grossly misunderstood, misinterpreted, and sometimes maligned.

There was a time, when life was simpler and less hazardous, that the CoC fulfilled, for most military men, the roles of substitute parents, grandparents, and deputy deity. Paternalism, military style, flourished.

The man in uniform today is very unlike the serviceman of those times. In 1976, the number of recruits scoring poorly on intelligence tests amounted to 4.8%. Twenty-five years ago that figure was 46%. The services today are composed of a higher percentage of high school graduates than they once were. Young service people today not only believe they can do their own thinking, they have already formed the habit of doing so.

And they are different in other ways. They are not impressed by the endless verbalizing on the subject of leadership; they are immune to the symbolisms of those earlier times; and they are full of questions, many of which

# Chain of Command

*(continued from preceding page.)*

go unanswered. Rap sessions, which have now become a regular part of the CoC idiom, would be poorly attended if attendance were not compulsory. Too often such sessions produce more telling than rapping—whatever that campus transplant pretends to be.

The military recruits a single man; but it reenlists a family. Servicemen are no longer willing, as so many of their predecessors were, to subordinate their families' interests to the "needs of the service" in matters that are clearly of a non-military matter: medical/dental services, housing, compensation and retirement. The dominant factor of their morale is family welfare.

He has learned, by observation and experience, that what Congress has given, it can take away. He has also learned that he is practically unrepresented in a world of pressure groups, special interest groups and their lobbies which are often successful. He quite correctly sees himself as a member of a voiceless minority. His military motivations are good, and durable—up to a point.

Military men and women want—and deserve—an advocate to promote and protect their interests. They want an advocate independent of the chain of command, outside the dictates of the Pentagon and Office of Management and Budget, responsible solely to themselves. They do not want an instrument to intervene between themselves and the chain of command, despite all the spooky blather about the non-democratic character of the military organization to the contrary—which misses the point entirely. Always has.

Brig. Gen. J. D. Hittle, USMC (Ret.), in a penetrating examination of the question of troop representation in non-military matters, published by the *Navy Times* in 1976, wrote: "A military union (would be) the result of such massive and fundamental causes that can't be stopped by saying that there shouldn't or won't be a union...all the optimistic claims by officials that the serviceman doesn't need a union, and all of the threats of prohibiting a union by law, won't stop one from happening."

None of those "fundamental causes" is of a military nature. The CoC is not the adversary, not the dispenser of commissary privileges, medical care for dependents, retirement pay; Congress is.

It might be well if those in the chain of command were to let the troops contend with their real adversary in their own way. The advocates of the CoC might better rethink their role in this contention rather than continuing to drag the baggage of the past into the future while playing the role of exorcist.

That baggage just gets heavier all the time, and since Vietnam and Watergate, exorcists seem to have lost their credentials.

# *Utility meters for public housing*

**By ROBERT B. SYKES AND STEPHEN B. JOYCE**
*Housing Management*
*NAVFAC HQ*

• Alexandria, Va.

To reduce energy consumption in military family housing, Congress has directed the Secretary of Defense to conduct a test program metering the utilities of housing and of designing a billing system to eventually charge occupants for energy consumed above an established quota

A General Accounting Office (GAO) report has estimated the energy consumption in military housing 30 to 50% higher than that used in civilian housing. As a result, Congress appropriated $8.5 million for the purchase and installation of meters, development of an "advisory" billing system, and administration of the test.

Ten activities were selected by the Department of Defense (DOD) to participate in the test. They encompass over 10,000 units in five different climatic zones. The three Navy activities selected are Great Lakes, Ill., Point Mugu, Calif., and Port Hueneme, Calif.

Over half the family housing units at the Navy test sites have now had meters installed with a completion scheduled for August. Meters are installed in each military-owned housing unit to measure the actual consumption of electricity, gas, oil, propane, steam, and hot water. High costs are being encountered in many units which are attributable to the rewiring and repiping necessary to isolate the utilities from adjoining units.

The development of a "norm" is to be determined by two techniques. A formula for the heating or cooling load, to be provided by Army's Construction Engineering Research Laboratory (CERL), is based on the physical thermodynamic characteristics of the unit plus daily weather data collected at each activity. DOD has already established the loads for lighting, appliances, cooking and domestic hot water based on the number of occupants and bedrooms in each unit and the energy source used.

The Navy has responsibility for developing an advisory billing system for use by all of the armed services. The first portion of the billing system will determine the housing unit norm from CERL's formula to compute the heating or cooling load and adding the DOD established loads. Based upon the meter readings, the second phase of the system will produce bills for the occupants indicating any consumption in excess of their norms and the amount of any payment due, based on the station utility rates. *For the test period, payments will not be collected.* However, occupants exceeding their norms will be asked to return part of the bill in an attached pre-addressed envelope.

The test is scheduled for one year, with a final report to Congress due 1 January 1980. Congress will evaluate the results and possibly may order metering of all units in the 50 states, the District of Columbia, Puerto Rico, and Guam. It is visualized that eventually bills for excess fuel consumption will have to be paid by housing occupants!

# The blue and gold teams of NMCB-3

By CDR Q.E.D. LEWIS, CEC, USN
*Commanding Officer, NMCB-3*
*P.E., Va.*

• Port Hueneme, Calif.

In April 1977 NMCB-3 *Blue Team,* deployed to Okinawa to relieve NMCB-74 at Camp Shields. This deployment was unique to the Seabees, and represented months of intense planning, as NMCB-3 was launched in a *Blue/Gold* mode of operation.

The *Blue/Gold* concept was developed to provide continuous construction support to Navy and Marine activities located in Western Pacific areas. The reduction in the number of construction battalions resulted in gaps in the Naval Construction Force (NCF) presence in Okinawa and other Pacific locations. Considering that Seabee construction is a major source of facilities support, a plan to maintain a continuous presence was needed. Several alternatives were considered; however it was highly desired to maintain an eight month deployed—six month home port cycle—for the morale and welfare of the men. (By coincidence, NMCB-3 had previously been permanently deployed to Camp Kubasaki, Okinawa during the construction of MCAS Futenma in the early '60s. In those days, the men returned to home port for 90 days every year.)

Basically NMCB 3 was restructured into two essentially equal teams. The "mirror image" teams were structured with the same staff structure as a standard naval mobile construction battalion (NMCB). Each had a headquarters company and a composite company. The composite company had equipment, shops/camp maintenance, and construction platoons. To meet area requirements, detachments were formed for remote deployment to NAF Misawa, NAF Atsugi, MCAS Iwakuni, Naval Station Subic Bay, and Diego Garcia.

The Detachment at Subic Bay was configured as the battalion's air detachment. The commanding officer and senior staff members were placed on the *Gold Team,* while the executive officer and his staff deployed with the *Blue Team.* Deployments were scheduled with each team on an eight-and-six rotation with overlaps on Okinawa for a brief turn-over period.

Since most of the battalion is remote from the headquarters, the *Blue/Gold* mode has brought into sharp focus the need for *centralized policy* and *decentralized execution.* Definitive guidance is needed to provide remote operating units a means of running their own show while still retaining the ability to enter and use the battalion headquarters support capability. Reporting requirements have been standardized and streamlined to allow integration for consolidated status reports to higher authorities.

However, once armed with this guidance, and their project tasking, OICs are instructed to "go forth and do well." Day to day decisions and responsibility for the project accomplishment and welfare of their men is left to the OIC. Construction progress is monitored by the biweekly SitRep, and conformance to battalion standards by frequent on-site visits.

As required, mini technical and management assistance visits are made by various members of the Okinawa Headquarters. Since the battalion will reap the benefits (or other effects) of its prior deployment, a long term view is being taken to future projects and resources management. We know we can't hold our breath and hope for the best.

By looking beyond the near term, it is possible to make minor shifts in men between detachments to cover peaks and lulls in construction workload. Maximum use is made of organic airlift to reduce travel cost.

Personnel assignments are a dominant and dynamic process in the *Blue/Gold* mode. Basically a projection of future team strength is maintained and initial assignments are made to provide an equal balance between teams. Rotation dates are monitored to insure a detail maintains its capability throughout its deployment. To provide a variety to the men in duties and locations, a battalion preference card system is used. Each man can indicate up to three locations for his next deployment.

Our first experience resulted in being able to satisfy about 70% of the men to some degree. This gives the men a wide variety of duties and locations to choose from and has been especially rewarding to top performers.

Considerable emphasis has been placed on maintaining readiness. Several plans have been written to recombine and mount out the battalion as a unit under a variety of operating modes. Since the air detachment is at Subic Bay with its organic equipment, it is a close knit, functional unit. Each detail is configured with a broad cross-section of Seabee capability so it is like a Seabee Team and could deploy to any location as a self-sufficient working element. Considering the battalion has two air detachments and six deployable other detachments always working as a team, a graduated response for a wide variety of contingencies is possible without disrupting the battalion's standard mode of operations.

The *Blue/Gold* mode has placed increased meaning on individual performance. There is no such thing as "a chief," he is "the chief." This goes for all ranks and ratings. The effects have been rewarding, both for the men and for the command.

You will note I avoided the term "split battalion" which I abhor; we have a *Gold* Team and a *Blue* Team, both part of NMCB-3 and all of our Seabees know it.

# *more pages for the NAVFAC/CE*

**A RARE VISIT** by RAdm Lewis B. Combs, CEC, USN (Ret.), center, is made to the Naval Construction Battalion Center, Port Hueneme, Calif. Accompanied by Capt. Anthony P. Pasquariello, CEC, USNR (Ret.), right, they meet with Capt Robert E. Quinn, Jr., the center's acting commanding officer.

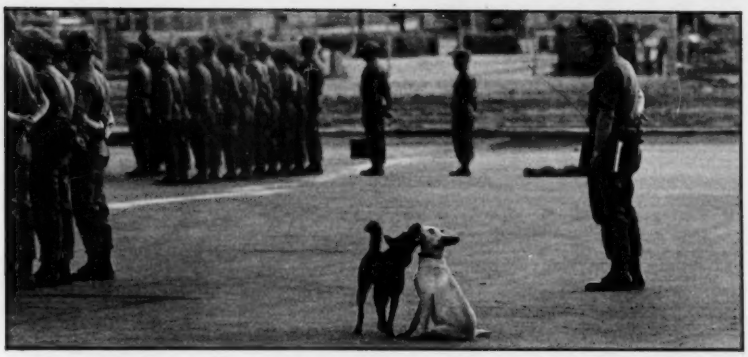
**RADM PAUL R. GATES**, CEC, USN, is CEC's newest rear admiral. His new post is that of Deputy Commander for Planning at NAVFAC Headquarters.

**HONORED**-Arthur J. Fox, Jr., Editor, *Engineering News-Record*, presents Capt James W. Weir, Jr., CEC, USN, OICC Trident, with a plaque citing him as one of "the many men who serve the best interests of the construction industry".

**GRADUATES** of CECOS' Basic CEC Officers Course, Class 146, are pictured: Front row from left— Ens Joseph M. Lynch, III, Lt Harold D. Currie, Lt David G. Roach, Lt John W. Bushong, Ens Joe M. Gleason; Back row from left— Ens Walter F. Lundin, Ens Jon M. Paxton, Ens Gary J. Keil, Ens Timothy F. Biggins, Ens Christopher Schanze, Ens Edward Eng, and Ens Marc A. Watson.

**TRYING TO KEEP UP WITH THE CHIEF**— RAdm Donald G. Iselin, CEC, USN, Commander, Naval Facilities Engineering Command, and Captains Ralph A. Smith, CEC, USN, Officer in Charge of Construction, Marianas, and Willard G. Shafer, CEC, USN, Commanding Officer, U.S. Navy Public Works Center, Guam, are shown during RAdm Iselin's visit to Guam military installations.

# *EC/SEABEE family album*



**PARADE, REST!**—While everyone else is standing in ranks, the company mascots take the opportunity to frolic about, obviously with little or no thought to military matters. The two playful pups are "members" of the Naval Mobile Construction Battalion Three (Gold Team) stationed in Okinawa, Japan. (See page 15 for serious details of NMCB-3.)

**RETURNING** to his alma mater for the annual lecture in honor of his father was Lt Neil Bromilow, CEC, USNR, Instructor in Construction Contract Administration, CECOS (left, center), who toured New Mexico State University Engineering facilities with college dean John Hernandez (right) and Rear Admiral Charles C. Heid, CEC, USN, Commander, Atlantic Division, NAVFAC-ENGCOM, featured speaker at the fourth annual Frank Bromilow lecture. At left, graduate student Ernest Maestas describes his research project to treat wastewater with electrolysis, a process that may have shipboard application. (NMSU photo: Chuck Williams)

**INTRODUCING** RAdm Donald G. Iselin, CEC, USN, Commander, Naval Facilities Engineering Command (inset, right), is Capt LeRoy D. Lawson, CEC, USN (inset, left). The occasion is the Navy Facilities Systems Management Course No. 3 of the Navy School, Civil Engineer Corps Officers (CECOS), of which Capt Lawson is the commanding officer.

# Naval Facilities Engineering Command
# SITUATION REPORT

NAVAL PETROLEUM RESERVE PRODUCTION - The Naval Petroleum Reserves Production Act of 5 April 1976 directed development, operation, and production for an initial six-year period (extendable in three-year increments subject to Presidential approval) of the Naval Petroleum Reserves at Elk Hills (Naval Petroleum Reserve #1), Buena Vista (Naval Petroleum Reserve #2), both in California, and Teapot Dome (Naval Petroleum Reserve #3) in Wyoming. At Elk Hills where the highest production capability and largest reserve is available, facilities for a marketing capacity of 350,000 barrels/day are to be operational within three years. The Naval Facilities Engineering Command was tasked by the Secretary of Navy to assist in design and construction of the required facilities to support the development. The Naval Petroleum Reserves were transferred to the Department of Energy (DOE) effective 1 October 1977. Under a Memorandum of Agreement with DOE, NAVFAC will continue as Design-construction agent. The facilities portion of the program is estimated at $350,000,000 and includes as major elements: 188 mile pipeline, $100 mil; gas processing facilities, $100 mil; and on-reserve support buildings/roads/utilities development, $150 mil. A final Environmental Impact Statement (EIS) on the pipeline was filed with the Council for Environmental Quality (CEQ) on 16 September 1977. Project design is in various stages of completion with some portions completed and as of May 1977 approximately $40 million of construction being advertised. Design and construction is under the supervision of Officer in Charge of Construction, Naval Facilities Engineering Command Contracts, Elk Hills, San Bruno, California.

(NAVFAC Code 05)

SUPPORT OF THE 8(a) PROGRAM - The Secretary of the Navy, in a memorandum dated 22 December 1977 to the Chief of Naval Material, cited the Chesapeake Division of NAVFAC for placing the greatest number of 8(a) Contracts (30 contracts valued at $5.4 million) in FY77 with the Small Business Administration for subsequent contracting with minority-owned firms. The 8(a) program is that Program for Assistance to Socially and Economically Disadvantaged Entrepreneurs through the Procurement Process.

(NAVFAC Code 09J)

# PUBLIC WORKS TECHNICAL NOTES

## A Selective Pesticide

Once in a great while a pesticide is developed which is very selective against the target pest. Such a pesticide is DLP 787 which is effective against our most troublesome domestic rodents: Norway rats, roof rats, and house mice. It is safe to use indoors, even in kitchens, provided it is placed out of reach of people and pets.

Household rodents readily eat treated baits and die a few hours later. Rodents do not become averse to any taste or aroma and thus can be baited until no rodents remain. It meets all the important requirements for a useful rodenticide. It is safe, effective, economical and has been approved by the EPA.

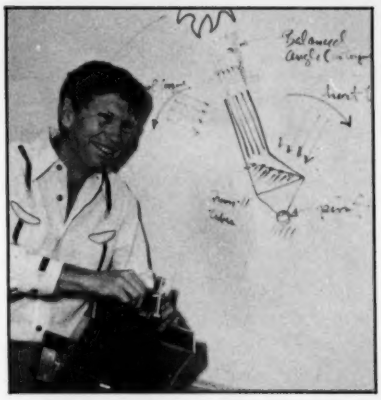
*For additional information, contact E. H. Richardson, Code 1012, LANTDIV, Autovon 690-7121.*

## NIEC Marks Year

The NAVFAC Industrial Engineering Center (NIEC) was established and formalized by NAVFAC Instruction 4862.4 of 22 February 1977 which designated the Center as the DOD focal point for Real Property Maintenance Activities (RPMA) Engineering Performance Standards (EPS) development, revision, and maintenance. The NIEC is tasked to provide DOD components with RPMA standard time data based on the latest state-of-the-art and to maintain the currency of the NAVFAC P-700 EPS manual series on a three-year cycle.

The NIEC will mark its first full year of operation under Army, Navy, Air Force, Marine Corps, and Defense Logistics Agency sponsorship during FY-78. Several EPS manual development and revision assignments were made to NAVFAC EFDs during FY-77. The NIEC is presently receiving the results and will carry these assignments to their three-year-cycle completion. The Center should become fully operational in FY-78.

*Correspondence should be addressed to: Director, NAVFAC Industrial Engineering Center, Atlantic Division, Naval Facilities Engineering Command, Att: E.L. Collins (Code 103A), Norfolk, VA 23511. Telephone: (703) 441-7121, Autovon 690-7121.*



**Dr. Carter Ward,** research mechanical engineer at the Civil Engineering Laboratory (CEL), Port Hueneme, Calif., adjusts the rotation linkage on a non-working mock-up of a simple, solar-powered fluid mechanical tracking device he has invented. When developed, the inexpensive tracker will accurately track the sun to within one degree. It does not require electricity for power. A schematic outline drawn on the board depicts the tracker's working principles.

## Insulate Your Sprinkler Systems

Don't forget that increased building insulation can sometimes result in freezing of sprinkler systems or potable water lines. A recent energy conservation project was accomplished by the addition of insulation above a suspended ceiling. The sprinkler system, located between the insulation and roof, was overlooked. Subsequent low temperatures resulted in the freezing of the sprinkler system.

When installing insulation, good engineering practice requires consideration be given to the resulting ambient temperatures where water lines are located. If subfreezing temperatures are a possibility, consider conversion to a dry system or place the insulation above the sprinkler system and water lines.

*Additional information may be obtained from A. S. Gallup, Code 1021, LANTDIV, Autovon 690-7121.*

## New Mopping Bucket Saves Dollars

There is a new type of mopping bucket which will allow use of the same water all day. The bucket has been developed as a dirt-trap bucket, built on the gravity pressure principle. It is reported to clean the water by trapping the dirt and dust particles picked up in the mopping operation.

Considerable dollar savings have been claimed through the reduction in detergents, waxes, and costly work hours. This item is included under Federal Supply Class 7920.

*Additional information may be obtained from J. S. Galvin, Code 1014, LANTDIV, Autovon 690-7121.*

## Lightweight Intermediate Metal Conduit

The 1975 edition of the National Electric Code (NEC) permits, for the first time, the use of a new type of metal conduit. This product is identified as Intermediate Metal Conduit, generally referred to as IMC. It is a rigid steel threaded conduit which can be used with any existing threaded conduit fittings. Because the wall thickness is less than standard threaded conduit, there is a weight reduction of about 25% with resultant reduction in purchase cost. The reduced weight also means easier handling and reduced labor costs.

IMC may be bent in standard benders, using EMT dies for smaller sizes and standard conduit dies for larger sizes. It is available in all standard trade sizes up to and including 4 inches. As described in Article 345 of the NEC, IMC can be used in applications, except certain hazardous areas, where standard rigid thick wall conduit is allowed.

While no Federal specification has been prepared to date for IMC, it is listed as UL-1242, Type 1. The normal finish is galvanized. As an economy measure, use of IMC is recommended where it is allowed.

*Additional information may be obtained from P. N. Rodgers, Code 1028, LANTDIV, Autovon 690-7121.*

# Applied Research for facilities engineering

By W.F. BURKART
*P.E. Calif.*
*Technical Director*
*Civil Engineering Laboratory*
• Port Hueneme, Calif.

The Navy's Exploratory Development Program (EDP) seeks to develop new technologies upon which system capabilities can be built. This is the part of the Navy's RDT&E program which most people would describe as applied research.

The planning of such a program across the total spectrum of Navy interest is difficult. The method used until FY78 was not completely satisfactory and not surprisingly, the EDP program was thought by many to be fragmented, lacking direction, and difficult to explain to Congress.

To improve the EDP planning, the Navy has introduced a concept used in some high-technology industries, the development of technical strategies. A technical strategy is a general approach to the achievement of a technical objective, which in turn supports an operational objective or need. Technical strategies seek to close projected gaps in technology which block mission capability. (Technology advances compete with other approaches to improve mission capability, such as innovative tactics and new combinations of existing weapons.) From the EDP, the Navy hopes to explore the military potential of emerging technologies and to obtain future high-leverage system concepts for closing operational capability gaps.

A technical strategy is an organized approach to obtaining a technical capability. It includes the allocation of resources and the illumination of choices between incremental versus big-step improvements. A technical strategy is not a compilation of tasks. A strategy well drawn will be a thin document which speaks incisively about the major areas of thrust, the major priorities, and the major allocation of resources.

From a technical strategy, plans are derived from which detailed sets of work assignments can evolve. The technical strategy provides top-down direction for the planners of the Navy's exploratory development program.

Strategies are prepared by a strategist with the assistance of a team of his choice. The strategist is appointed by the Director of Navy Technology, who reports to the Deputy Chief of Naval Material (Acquisition).

What are the essential parts of a technical strategy? First, the scope of the strategy is defined by the strategist. There will be overlaps with other strategies, or at least close relationships to them. Next, having defined the area of endeavor with which the strategy is concerned, the strategy team establishes the major issues, those conditions which bear on the technical approaches to be defined later. Then, the threats or operational requirements are determined, and an assessment of the state of the art is made with regard to each requirement.

Next, the objectives are described. What operational needs does the exploratory development program address? What new or improved capabilities are sought? Is the objective to reduce cost? These objectives can be established after the assessment of the threat, the requirements, and the state of the art.

With the objectives described, the technical approaches toward the objectives are listed. The key thrusts, the difficult problems, the technology gaps, the information and demonstrated hardware necessary to reach the objectives are set forth. The technical approaches are the bases around which the annual plans for exploratory development can be built.

Finally, the strategist recommends the level of effort to be applied to each technical approach so that there will be a reasonable chance of attaining the technical objectives.

The strategies are integrated into a comprehensive exploratory development program for the Navy. They provide the rationale for and the substance of the Navy's total exploratory development program. The Navy can show Congress what it seeks to accomplish, and why.

The strategies are used by the system commands, the program managers, laboratories, and Chief of Naval Material (CNM) program element administrators to evolve plans which will have meaning in the achievement of operational goals.

NAVMAT uses the strategies as guidance for adjusting emphasis (funds) in the exploratory development program.

Thus far, a general picture of strategies has been drawn. (The current strategies are listed in Table 1.)

The main concern of the Civil Engineer Corps is the facilities strategy, a sub-strategy of logistics. The facilities strategy is for exploratory development related to installations of the Navy and the Marine Corps that may be permanent or contingent in nature. The strategy relates to the planning, design, construction, maintenance and operation of these installations. Related strategies are ocean environment and engineering, materials, and amphibious warfare.

Several major issues influence the direction of the facilities strategy. Facilities for contingency operations depend upon the use of new ship types, the magnitude of the logistics problem of the Marine Corps, and the mobility the Navy and the Marine Corps are incorporating into tactics. Another factor is the relative roles of the Army and the Marine Corps in the 1985-1995 era. Also, the role of the Naval Construction Forces in that period influences the direction of the strategy.

Other factors are: the extent to which cable structures will be installed in the deep ocean; the types of weapon systems, their platforms, doctrine, and shore bases available to the 1995 fleet; the extent of technology available from the civil sector, especially with regard to energy consumption and environmental protection.

When addressing exploratory development required for shore installations, it is difficult to deal with weapon threats. Instead, the emphasis is related more easily to operational requirements. Several operational requirements that relate to the facilities strategy are unloading facilities on an exposed beach for commercial container ships which cannot unload themselves; the capability to install facilities in the deep oceans; building and maintaining the shore establishment as less cost (we presently spend about 1.5 billion dollars per year to build and maintain our facilities); the need to avoid environmental restraints as the nation enhances the quality of life by reducing water, air and noise pollution, so that such restraints will not be imposed on the Navy to the extent that it would be prevented from performing or training for its operational mission.

From the operational needs such as those described above, the strategy team has derived twenty major technical objectives (see Table 2). Bear in mind that the exploratory development program produces a technology base from which systems are developed and acquired in other programs. Thus the

major objectives of the EPD are not necessarily completed systems or hardware.

For each of the major technical objectives, such as those described above, a time-line has been defined. The level of effort required and the time frame in which the strategist estimates the results can be obtained are shown. Since applied research is a risky business, the level of effort required and the time it takes to produce results cannot be predicted with precision.

Progress in exploratory development, and later in systems development and acquisition, depends on basic research. While the strategy does not deal with basic research per se, it does point out problems which should be attacked in that phase. Some basic research results which will support the facilities strategy are: mechanisms for controlling turbidity in seawater; a practical mechanism for attenuating ocean swell near shore; prediction models for the degradation of facilities with time; the mechanics of moisture migration through paint and coating barriers; more reliable indicators for the effectiveness of pollution control processes.

The process by which the facilities strategy is derived can project results which will be introduced to the fleet and the shore establishment. (The projections for FY79 are shown in Table 3. Longer range results are shown in Table 4.)

A final task of the strategist is to indicate which existing programs should be redirected, given greater emphasis, or stopped completely. For example, with regard to contingency facilities, more emphasis should be placed on insuring a damage repair capability for Naval Construction Forces.

The facilities strategy has been derived from a search of available information dealing with future operational requirements, scenarios, missions and threats.

The efficacy of the technical strategies is yet to be determined, but the Navy is pushing hard to introduce this concept of program planning which will result in top-down direction and a coherent, rational program of applied research.

*The author has been named facilities strategist for the Navy's Exploratory Development Program and invites comments or suggestions for major technical objectives for the overall facilities strategy. Contact should be directed to W. F. Burkart, Technical Director, (Code L03) Civil Engineering Laboratory, Port Hueneme, Calif., 93043. Tel: (805) 982-4520 Autovon 360-4520.*

| FUNCTIONAL AREAS | STRATEGY AREAS |
|---|---|
| SEA CONTROL | • Anti-surface, air & space warfare<br>• Anti-submarine warfare<br>• Mine warfare & mine countermeasures |
| POWER PROJECTION | • Amphibious warfare<br>• Tactical warfare ashore<br>• Special warfare |
| MOBILITY | • Air vehicles<br>• Surface and undersea vehicles<br>• Nuclear propulsion |
| MISSION SUPPORT | • $C^3$ (Command, Control, Communications)<br>• Logistics and Facilities<br>• Personnel support<br>• Ocean surveillance |
| TECHNICAL SUPPORT | • Electronic devices<br>• Ocean environment and engineering<br>• Materials/chemistry<br>• Tactical nuclear |

1

**MAJOR TECHNICAL OBJECTIVES**

- A POL system to support a Marine Amphibious Force.
- Facilities to move cargo ashore from an open seaway.
- Rapidly installed stabilized surfaces.
- Rapidly emplaced, retractable facilities for contingency operations.
- Improved utility systems for mobile bases.
- Ability to predict, modify response of, ocean cable structures.
- Measure the geotechnical parameters of seafloor sediments.
- Work systems for Underwater Construction Teams.
- Electrical power transmission to the seafloor for construction.
- Port facilities for the fleet of the 1990s.
- Means for assessing impact of facility condition on readiness.
- Improve the reliability of utility systems.
- Reduce the vulnerability of the shore establishment.
- Provide technology to reduce life cycle cost of facilities.
- Reduce energy consumption ashore.
- Demonstrate the applicability of solar, wind, and geothermal energy.
- Determine characteristics of synthetic fuels and waste oils.
- Technology for disposal of unique industrial wastes.
- Control noise reliably in ground run-up facilities.
- Demonstrate processes for converting wastes to resources.

2

**FY 1979 GOALS**

Discover a resin for surfacing systems with desired shelf life, tolerant of moisture and cold weather.

Predictive, analytical model in hand for cable structures.

Feasibility of underground construction for facilities determined.

Geothermal potential of sites at Coso, Adak, Lualualei in hand.

Feasibility of densifying solid wastes at Navy stations determined.

Feasibility of sedimentation control in harbors determined.

3

**SOME ULTIMATE EXPECTED CAPABILITIES**

- Rapidly installed, retrievable base components.
- VSTOL operations unlimited by facilities.
- Reduced cost of facility maintenance.
- Accurate allocation of maintenance dollars.
- Attachment of structures to seafloor to 20,000 feet with confidence.
- Reduction of energy consumed ashore by 20%.
- More reliable surveillance arrays.
- New concepts for waterfront support of fleet.

4

The ground surface of this truck loading station should be paved with concrete and drainage should be directed to a containment basin. (Photo 4)

# Oil spillage

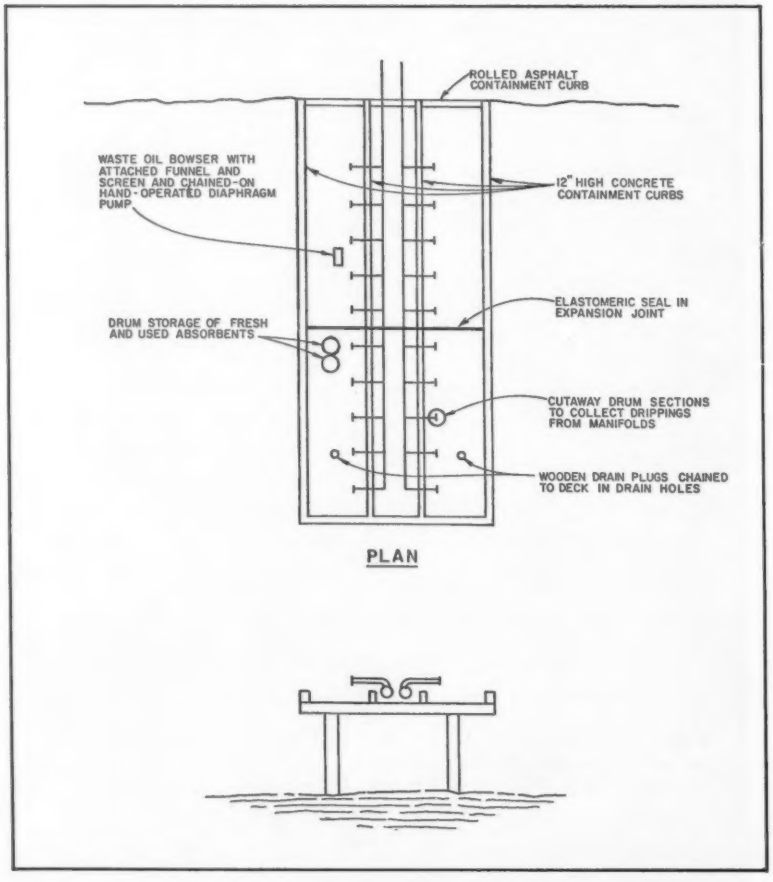
*(Continued from page 6)*

underpier lines. (A typical fueling pier with adequate containment and other necessary provisions provided is illustrated in Figure 3.)

Truck and tank car loading and unloading areas should be paved with concrete. Runoff and oil spillage should be completely contained and drained to one or more drainage inlets. Containment can be provided with standard curbing, rolled curbing, recessed concrete gutters with grating-type covers, or by merely grading towards the inlets. Discharge from the storm drainage inlet should be directly to a containment basin. The capacity of this containment basin should be such that it can contain the volume of the largest single compartment of a tank car or truck used at the facility. In most cases, discharge from the containment basin can be directed to the storm drainage system and an oil/water separator is not required. (A section view of a typical facility is shown in Figure 4. A typical containment basin is generally illustrated in Figure 5. Many of the truck loading facilities are gravel-surfaced as illustrated in Photo 4.)

Drum and hose storage areas should be paved with concrete and provided with containment curbing. If the area is relatively clean, a pipe with a lockable valve should be installed through the curbing to drain rainwater. This valve normally should also be kept closed and opened only to drain clean stormwater. Where the area shows evidence of considerable spills (e.g., drum storage racks in constant use as demonstrated in Photo 5), no outlet pipe should be installed through the containment curbing. Rather, a shed roof should be

**Typical fueling pier (Figure 3)**


ROLLED ASPHALT CONTAINMENT CURB
WASTE OIL BOWSER WITH ATTACHED FUNNEL AND SCREEN AND CHAINED-ON HAND-OPERATED DIAPHRAGM PUMP
12" HIGH CONCRETE CONTAINMENT CURBS
ELASTOMERIC SEAL IN EXPANSION JOINT
DRUM STORAGE OF FRESH AND USED ABSORBENTS
CUTAWAY DRUM SECTIONS TO COLLECT DRIPPINGS FROM MANIFOLDS
WOODEN DRAIN PLUGS CHAINED TO DECK IN DRAIN HOLES
PLAN

**Concrete pavement should be installed. This drum storage area needs a concrete slab surrounded by curbing to contain spillage. Shed roofs over this area will minimize the stormwater collected. (Photo 5)**

installed to reduce stormwater collection. Accumulated water should be removed to an oil/water separator or otherwise treated as waste oil. Spills or fluids accumulated in these areas should be removed with absorbents.

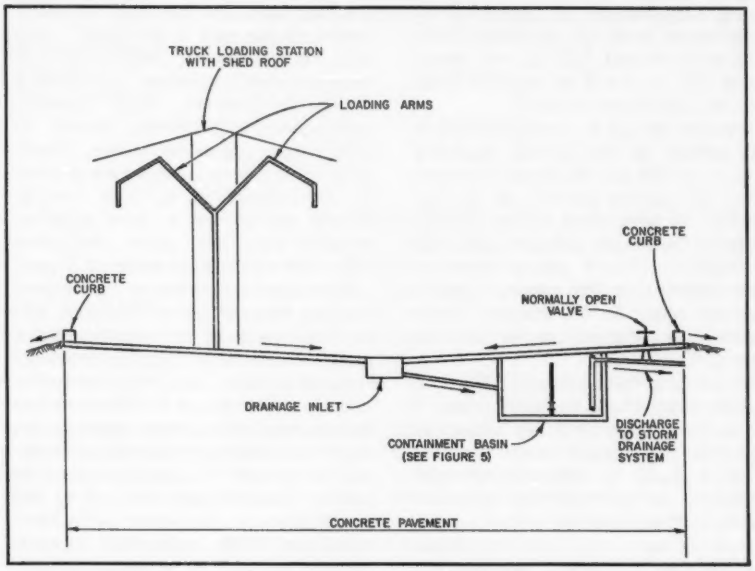
Wherever possible, it has been attempted to prevent the mixing of water and oil and to contain oily discharges at their source where they can be contained for disposal. Accordingly, the use of oil/water separators has been limited to areas at which the generation of oily residues is inescapable (e.g., washracks and other washdown areas).

Three normal applications for oil/water separators are as follows:

- Interior oil/water separators, with effluent discharged to the sanitary sewer.
- Exterior oil/water separators serving confined areas that contribute insignificant quantities of stormwater, with effluent discharged to the sanitary sewer.
- Exterior oil/water separators serving areas that receive a significant quantity of stormwater (e.g., fuel truck parking areas), with effluent discharged to drainage courses. Dilution should minimize the oil concentration in effluents during intense storms as long as the separator is properly sized and adequately maintained.

Few oil/water separators are designed to routinely achieve removal efficiencies acceptable for direct discharge to watercourses (10 mg/L oil and grease). However, most of the units, if maintained, can achieve better than 100 mg/L oil and grease concentration in the effluent, which is an acceptable level for discharge to sanitary sewers.

*(Continued on page 24)*




**Typical truck loading station. (Figure 4)**

# Oil spillage

*(Continued from preceding page)*

Cast iron valves and flanges are found on many storage tanks, pier pipelines, and shore pipelines. Many of these cast iron components were installed as recently as 1972. Cast iron components have an expansion rate different from adjoining steel pipe and their brittleness makes them susceptible to rupture from freezing or pressure surges. Therefore, and in accordance with current directives, all cast iron valves and flanges should be replaced with steel components.

Testing of all tanks, fuel pipelines, and fuel hoses should be performed regularly by qualified personnel. Reports should be filed when tests occur.

For most aboveground storage tanks, visual inspections are recommended and these inspections should take place, at least, on a semi-annual basis. All underground tanks should be pressure tested (using 2 to 3 psi gas) and pressure losses measured. However, because many underground storage tanks are not effectively sealed, pressure testing is often not feasible. Therefore, for these tanks and all aboveground tanks, fuel level readings should be regularly compared and checked for gauge losses. If inventory losses are established for a tank or if the tank fails the pressure or visual test, it should be removed from service until effectively sealed.

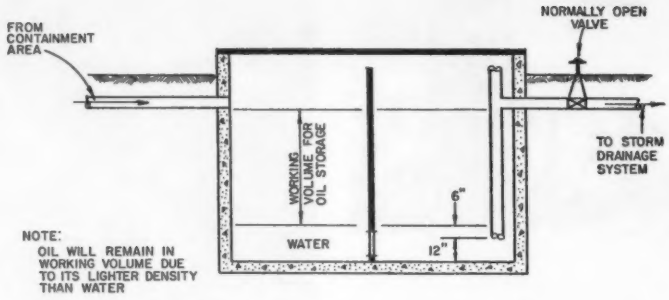
Pipelines should be statically tested to 125 percent of the normal operating pressure or 100 psi, whichever is greater, using the storage product as the test medium. In areas where leakage is likely (older or historically deficient fuel lines) or would create a serious problem (pier pipelines) pipelines should be hydrostatically tested to 150 percent of the normal operating pressure or 100 psi, whichever is greater.

Hoses should be hydrostatically tested to 150 percent of the operating pressure. Hoses should then be clearly labeled as to the test pressure and date of the test.

As a guide to selecting remedial measures, an attempt was made to recommend projects that were adequate and at the same time relatively simple and low-cost. To this end, two rules-of-thumb were used to guide in selecting remedial measures. These include:

- Make the proper handling and disposal of spilled or waste oil the easiest course of action.
- Prevent the mixing of oil with water whenever possible.

The first rule was formulated to prevent the inevitable oily discharges which result from personnel shortage or error. In its application, the first rule mandated the closure or consolidation of vehicle and aircraft washracks and maintenance facilities. Discharge of floor drains to storm sewers was discontinued, requiring the use of absorbent materials to clean up oily residues. Often oily accumulations from machine parts are not the only oil pollution contributor at such facilities. One product used to clean oily machine parts, itself contains more than 5,000 mg/L oil and grease.




**Containment basin schematic. (Figure 5)**

Other applications include placing the fill port for a waste oil storage tank inside the contributing maintenance building. Since oil spills around the fill port are inside the building, rainwater runoff of the spill is prevented. Such spills are more readily cleaned up since they are more apparent to building personnel. Bowsers, small portable tanks, were conveniently located to collect waste oil at the source. Hand-operated diaphram pumps were chained to the bowsers to facilitate transfer of oils and ensure a more spill-free transfer operation when unloading heavy and cumbersome waste oil drums.

The second rule-of-thumb was adopted because, when oil mixes with water, the increased volume of the waste becomes a greater treatment and disposal problem. From observation, spilled oil was found to accumulate around the fill ports for underground tanks and in drum storage areas. The preliminary remedial measure was to contain the subject area with curbing. Unfortunately, this allows the accumulation of rainwater in the contained area. If an outlet were installed through the curbing to allow the discharge of rainwater, maintenance personnel would be responsible for identifying the presence of oily residues in the containment area. In concept, the outlet should be opened allowing free discharge only if pure stormwater is present. If pure oil is present, the containment should be pumped out to allow controlled handling and disposal.

In practice, however, pump-out of oily accumulations is a burden on maintenance personnel. Since free discharge is the more convenient course of action, oily wastes as well as pure rainwater would be allowed to discharge freely through the outlet to the environment. If no outlet is provided, fluids would be allowed to accumulate allowing the oily film atop the water to overflow the curbed area.

The solution was to place a watertight cover over small containment areas (at fill ports) and shed roofs over larger containment areas (drum storage facilities). This prevents rainwater from collecting and restricts contained fluids to oil overfills and drippings. Since no outlet is provided, maintenance personnel are forced to pump out oily wastes in the containment as necessary.

Similar logic was applied for truck and tank car loading and unloading stations. Containment basins (as illustrated in Figure 5) were devised for such locations. All surface drainage from the area is directed to these basins. In normal situations, pure rainwater passes directly through the basin and is discharged to local storm drainage systems. Oily residues in the runoff are extracted and contained in the basin. No maintenance is required under these circumstances. However, if a spill does occur during oil transfer operations, sufficient containment is provided and the entire spill will be contained in the basin. Only under this circumstance is maintenance required, necessitating a simple pump-out. The end result is compliance with the intent of the Federal regulations without adversely affecting normal transfer operations. Most importantly, protection of the environment is not dependent on the constant attention and efforts of maintenance personnel.

The criteria summarized have been used as the basis for projects recommended for 18 Norfolk activities. The original reports provided the necessary technical basis and documentation for pollution abatement funding. Thus, the Navy is continuing the fight against oil pollution.

# Letters

Dear Sir:

I have just received and am reading with great interest the Fall issue of the *Navy Civil Engineer.*

I note that *Navy Civil Engineer* follows the commendable practice of expressing dimensions in both the English and SI Systems (example, page 41). However, may I suggest that a little editorial oversight to the conversions made, may be wanted.

A common error (which I have seen in other publications) is to take a dimension which is obviously rounded off or approximate in one system and translate it into the other with several decimal places of uncalled-for and probably unjustified accuracy, e.g., in the article I mention "-3 to -20 ft." becomes, "-944m. to -6.096m."

Now, obviously, it is nothing of the kind: -3.0000 ft. is certainly -.9144m., -3 ft. is -1m. and -20 ft. is -6m. The same comment, manifestly, applies throughout the article.

In short, the degree of accuracy or round off should be the same for *both systems.* If the English dimension is in feet only, the SI dimension should be either in whole meters or, at the most, to 0.1 meter. Similar principles will apply to weight, mass, force, etc.

I submit that you will serve the cause of metrication a distinct service if you adopt this approach as a policy.

All good wishes for continued success with *Navy Civil Engineer.*

*Sincerely,*
*Mark Jordan*
*Capt., CEC, USN (Ret.)*
*Albany, N.Y.*
*19 December 1977*

Dear Sir:

I enjoyed the Fall 1977 issue of the NAVY CIVIL ENGINEER except for one irritating item: the clumsy conversion in various articles of "British" units into metric equivalents. It would appear that whoever did the conversions sat down with a calculator, ground out numbers, and then plugged whatever numbers happened to result into the text regardless of what that did to upset its smoothness and clarity. This was particularly noticeable (and annoying!) in the otherwise interesting report on the results of the long-term deep submergence tests conducted by CEL on concrete spheres. References to a "...braided nylon 1.27cm rope..." or to "...18.29m of heavy chain" or to "...concrete structures with diameters up to 30.48m..." rather than to rounded figures such as "½ inch rope" or "60 feet of heavy chain" or "diameters up to 30 meters" merely served to overemphasize the newspeak of metrication rather than aid the author's communication with the reader.

Note that my objection is not to the use of metric quantities per se. It is to the use of awkward values, or the use of dual unit systems where a quantity in one unit system is also given as a clumsy figure in the other unit system. In my opinion it would be better to use a mixed system of units and refer in the same article in one place to "...½ inch rope" and in another place to "structures with diameters up to 30m" than to try to contort all figures into one system for the sake of needless uniformity.

**He's only a .237 liter... But his friend is a husky 1.82 meter-er.**

Perhaps one day standard sizes of all items will be stated in terms of nicely rounded sequences of metric values. Until that day arrives "biunitism" in the articles in the NAVY CIVIL ENGINEER would seem to be appropriate.

*Cordially,*
*D. J. McAuley*
*LT, CEC, USNR*
*FPO, New York*
*16 December 1977*

Dear Sir:

While re-reading another article in the Fall 1977 *Navy Civil Engineer,* I happened onto the "Advanced Ocean Construction Techniques" article, pg. 44. The problem is incorrect metric conversion! I am not sure what your editorial policy is on metrication, but I would say it would be better to use one or the other system since many authors do not seem to know how to convert! There are obvious errors in the KG-TON conversions. Unfortunately, one cannot tell which figure is the correct source figure—which is particularly frustrating in reading a technical article. That is, one gets the impression that the crane is ten times stronger than it really is. Or, is it really ten times weaker? Hence, the dilemma only you can solve.

I would sugest we go metric all the way and leave the obfuscators in their own dust!

*Sincerely,*
*Joseph L. Henley*
*LCDR, CEC, USN*
*NAS Millington, Tenn.*
*18 January 1978*

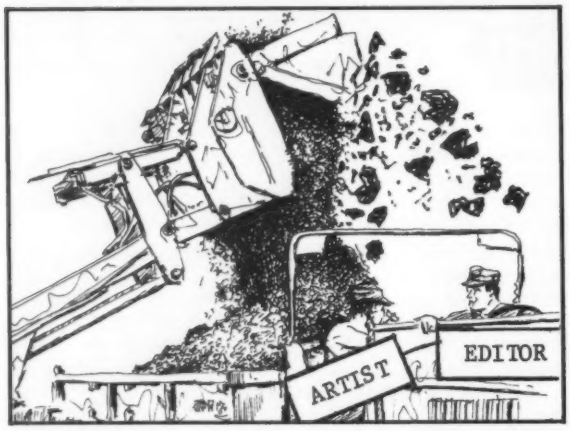
• *We appreciate the comments and suggestions of Readers Jordan, McAuley, and Henley ... and plead guilty to permitting some metric converters to get carried away into infinity. The style for this periodical is SI measurement with paranthetical English equivalent. For related commentary see "Spinning Our Metric Wheels" by LTJG James A. McConnell, Jr., (appearing next issue).—The Editor.*

The artist's depictions accompanying the article, "The Environment During Construction," should have been more closely checked for *safety*. Specifically: No one sits in a truck when it is being loaded by overhead means. The level of the crane is way out both fore and aft and listing to one side.

While the article talks of the many aspects of the environment during the construction phase and the protection thereof, what construction agency could possibly concern themselves with protection of the environment if they operate as shown in the sketches?

*S. F. Lowe*
*CWO2, CEC, USN*
*FPO, San Francisco*
*3 January 1978*

(Editor's Note: See below)




Dear Editor:

Your 1977 Readers' Survey (NCE Fall 77, pg 23) has two interesting statistics—the top rated standing feature *Speaking From Topside* and the lowest overall rating *Editorial Content*. In review of the last nine issues I note frequent absences of Topside, Letters, Publisher's and Editor's Notes; but was pleased to observe another candidate for standing features, *Opinion and Outlook*. I enjoy the current and pointed writings of Ted Murphy and the stimulus he provides.

LCDR Smith's observations (NCE Fall 76, pg 31) on the naval officer's role and keeping current brings to mind the excellent articles and essays in the *Naval War College Review* on the four Navy missions (I. Nuclear Deterrent, II. Sea Control, III. Projection of Power, IV. Naval Presence) and the current CNO's grouping of these missions into two functions (*Surface Warfare*, Mar-Apr 77). Facilities support of the Navy missions with declining overseas basing capability is one of our major challenges in the 80's. Mobile Ocean Basing Systems are part of the answer.

Basic CECOS students might enjoy and profit from an assignment to review Defense and Navy journals in the missions and goals arena and make a presentation to the class. This additional process *learning* experience in the naval warfare area should sharpen the individual's continuous education plan and yield higher returns than the decrement in facility systems *content learning*. LT and LCDR CECOS classes might be asked to prepare an essay in support of the "Publisher's" goals and commitments (NCE Summer 77, pg 62), with the best being published in NCE.

Other sources of valuable opinion and outlook are the remarks of CECOS graduation speakers. Volume I of *It Has Been Said* contains much serious reflection on professional values and the insights of experience. Captain Mooney's recent *Question, Think and Act* discourse and yes/no decision system would be an *NCE Classic* and provides another example of Captain Phelps' HATH list of good officer requisites—honesty, aims, tenacity, and HUMOR. The talk of RADM Morrison, USN, (Ret), on the criteria and philosophy of success and what a line officer expects of the CEC merits publication. However, a *It Has Been Said* standing NCE feature need not be limited to CECOS graduations or naval military words. The sole civilian speaker in *IHBS*, Volume I, notes, "An overlooked attribute of importance to military leaders is 'salesmanship,' which often is called practical psychology or public relations. The true salesman knows he has a good product, is sold on the product himself, and doesn't accept 'no' as a final answer."

We have heard from the Readers and Publisher—now how about the Editor?

*Yours truly from*
*the U.S. Heartland,*
*Thomas L. Boennighausen*
*CDR, CEC, USN*
*Naval Weapons Support Center*
*Crane, Indiana*
*5 January 1978*

Dear Sirs:

Underground structures have been the subject of increased attention since the energy crisis re-focused attention on conservation techniques in new construction. From the fine article by LCDR Lloyd S. Jones, CEC USN, *Thinking Down Through Earth*, Spring '76, to current issues of *Popular Mechanics*, there are numerous opinions about the future of underground housing.

Because of the known energy advantages and some assumptions about sound attenuation, NAVFAC is undertaking a design effort to determine if an application of underground construction can be made with military family housing units. This prototype application will be in the form of an earth-covered four-family unit housing structure sited at a Navy or Marine Corps air station in a restrictive noise zone of CNR 2.

Probably the most important learning experience will be in obtaining from military families their perception of the change in environment and life-style. Obviously, designing to meet the human factors will be as important as the energy and acoustical considerations. One additive benefit anticipated is the opportunity to give families a greater sense of privacy in an era when housing densities are reaching maximum levels.

If the investigative design is productive and construction cost estimates reasonable, a proposal will be made to construct a prototype in the FY79 or FY80 Navy family housing new construction program.

Early on, we found that when we mentioned an "underground" house, that the listener visualized a cave-like environment. Apparently, it will make no difference if our design ends up with a partially earth-covered structure that is entirely above normal ground lines or if we are in fact completely below natural grade; we will always have a perception problem.

We are naming this structure "Meso-Quad Housing," in view of the meso (intermediate) environmental siting of the four-plex housing unit.

*Richard T. Hibbert*
*Reg. Architect, California*
*NAVFACHQ*
*Alexandria, Va.*
*11 November 1977*

# ON ADVICE OF COUNSEL

By W. H. SPECK
*Counsel*
*NAVFAC HQ*

*"It is better to live rich than to die rich."*
*—Samuel Johnson*

But defense personnel may believe that both alternatives are barred to them. Standards of conduct and conflict of interest statutes and regulations bar any better living at the expense of those doing business with the Government. And sumptuary laws limit even official or necessary costs from Government funds where there may be the appearance of extravagance or misuse.

A 1912 statute forbids use of appropriated funds for telephone service in private residences or apartments, excepting tolls for official long-distance calls. The Secretary of the Navy may authorize telephone connections between public quarters and official switchboards; *but never has!* Many officers consider an official telephone in their residence, not an extravagance but a necessity to assure direct communication particularly for emergencies.

A 1946 statute forbids expenditures for appropriated funds for motor vehicles not used exclusively for "official purposes," defined to exclude from "official purposes" the "transportation of officers and employees between their domiciles and places of employment." Many officers consider an official vehicle, readily identified by color and marking and equipped with siren and radio, a necessity to be available 24 hours a day for security investigations, emergencies, etc.

A 1948 statute limits the size of public quarters, ranging from 2100 square feet for flag officers down to 950 for lower grade enlisted men, with a 10 percent increase for commanding officers. A series of annual statutes codified only in 1977 authorizes leasing of family quarters at an average cost in the United States of $280 per month (no unit to exceed $450).

Annual authorizations have for many years limited the average construction cost of family housing units, now $35,000 in the United States, with no unit to exceed $51,000. These sizes and prices are not large, and the limits generate much casuistry as to what is included and excluded. In the future, states may begin to tax a military man's occupancy rights in this housing. *U.S. v. County of Fresno,* and Department of Defense and Navy directives of course forbid use of Government property, manpower and services for other than official Government business.

These legal rules not only impose a moderate, even Spartan, style of life so far as what the Government provides is concerned, but also forbid the use of Government vehicles, telephones, etc., for some official purposes that might lend themselves to or give the appearance of abuse for private benefit.

A body of jurisprudence—some legislative history, many Comptroller General decisions, and a few court cases—has grown up around these rules.

They must be carefully observed to avoid embarrassment, assessment of costs, or disciplinary action.

# ABSTRACTS OF GRADUATE THESES

By LT NEIL F. BROMILOW, CEC, USNR
*Instructor, CECOS*
*P.E., Va.*

Timely research of practical problems is being conducted each year by approximately 63 junior Civil Engineer Corps officers who attend civilian and military postgraduate schools. Their areas of study range from technical subjects in civil and nuclear engineering to management and computer science. These officers are the "PG" students sponsored by the Naval Facilities Engineering Command, and many of them write a thesis to document their efforts.

The Moreell Library at the Naval School, Civil Engineer Corps Officers, is now cataloging and maintaining the postgraduate theses written by CEC officers. This provides a centralized and accessible source of research for future students. Publication of selected abstracts in *The Navy Civil Engineer* magazine will provide broader dissemination and also identify officers who have gained specialized knowledge which could be utilized by other field personnel.

## CONSTRUCTION MANAGEMENT (CM) METHODS AND THEIR SUITABILITY FOR USE IN U.S. NAVY CONTRACT CONSTRUCTION

KEY WORDS: Construction Management; Survey of CM Systems

ABSTRACT: In this paper the goals and objectives of the NAVFAC military construction program are presented as well as the existing system that implements the program. The performance of the existing system is also discussed. Then construction management alternatives are explored and the performance of these alternatives as now used by the General Services Administration and the Department of Health, Education and Welfare is presented. A comprehensive tabulation of 14 variations of construction management is shown with the possible impacts they would have on the NAVFAC military construction program. Conclusions are drawn concerning benefits from integrating design and construction; disruption of the existing system due to implementation of construction management; assumption of the contractor's risk; and modifications required in the existing procurement system to accommodate construction management.

REFERENCE: Broaddus, James A., "Construction Management (CM) Methods and Their Suitability for Use in U.S. Navy Contract Construction," University of Texas at Austin, May, 1976, THESIS: Master of Science in Engineering.

## AN ANALYSIS OF MAINTENANCE SERVICE CONTRACTING AT NAVY AND MARINE CORPS SHORE ACTIVITIES

KEY WORDS: Maintenance Service Contracting; Public Works; Survey of Shore Activities re Satisfaction with M.S. Contracts

ABSTRACT: This study analyzes the effectiveness of maintenance service contracting with respect to the base Public Works Officer's ability to properly maintain facilities. The hypothesis for this study is as follows: Maintenance service contracting is increasing at Navy and Marine Corps activities. The lack of appropriate organizational resources to administer these contracts is causing marginal or unsatisfactory performance as evaluated by the activity Public Works Officer. Conclusions are made concerning utilization of maintenance service contracts; quality of contract documents; award to low conforming bidder; and service level action and organizational adjustments regarding procedures and staffing.

REFERENCE: Miles, John H. T., "An Analysis of Maintenance Service Contracting at Navy and Marine Corps Shore Activities," Pepperdine University, December, 1977, THESIS: Master Of Business Administration.

# WORK REQUEST PRIORITY CODE SELECTOR

By RAYMOND SANDFORD, JR.
and
JAMES O. DeLOZIER
*Maintenance Control Division*
*Public Works Department*

• Point Mugu, Calif

The planning and control of work are perhaps the most basic and pervasive of all managerial functions. Time and effort are wasted and opportunities lost by failure to establish consistent priorities for accomplishing maintenance and repair work. So many times we fall prey to relying on tradition, pre-conceived opinions, or past performance in deciding priorities for work that gets done and work that gets deferred. What "Road Signs" do we stress to make certain we obtain the greatest productive advantage in accomplishing maintenance and repair work?

At Point Mugu, California, Headquarters of the Pacific Missile Test Center, the Public Works Department, Maintenance Control Division, receives and processes more than 1000 maintenance and repair work requests annually. It was recognized that work requests needed to be assigned logical priorities to maximize success and avoid unproductive effort. The evolvement and use of a simple tool called a Work Request Priority Code Selector provide a method of assigning priorities.

The Selector permits the assignment of priorities objectively based on importance alone. Subjective thinking is obviated. It permits planning personnel to identify easily proprietary objectives and goals and allows alternative strategies to accomplish them.

The Work Request Priority Code Selector is comprised of two synergetic tables—an Importance Level Code Table and a Priority Code Table. The tool classifies work by the relationship between importance levels and the Level of Maintenance Codes (LMC) based on guidelines from Volume One of NAVFAC MO-322, Inspection of Shore Facilities. The Importance Level Code Table is used to establish the work classification and the importance level. The Priority Code Table establishes the numeric priority value in which the work should be done.

The following example illustrates the simplicity in using the Work Request Priority Code Selector—A work request states that the roof of Building 500, used as a missile test facility, is leaking and causing damage to test equipment resulting in work stoppages! Evaluate and assign a work priority to accomplish the work:

**Step One**—Using the Importance Level Code Table, it is determined the roof leak is mission related and the importance level is high; therefore, lines projected from the high importance level and the mission work classification intersect in block 3 of the table.

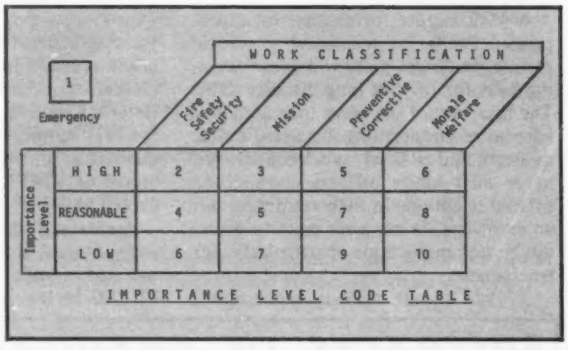
**Step Two**—Transfer the value of 3 obtained in Step One to block 3 of the Importance Level Code at the top of the Priority Code Table. Assume that Building 500 has been assigned a Level of Maintenance Code (LMC) of "A"; therefore, lines projected from the Level of Maintenance Code "A" and block 3 of the Importance Level Code intersect in block 3 of the Priority Code Table. Consequently, a priority work value of 3 is assigned to repair the roof leak.

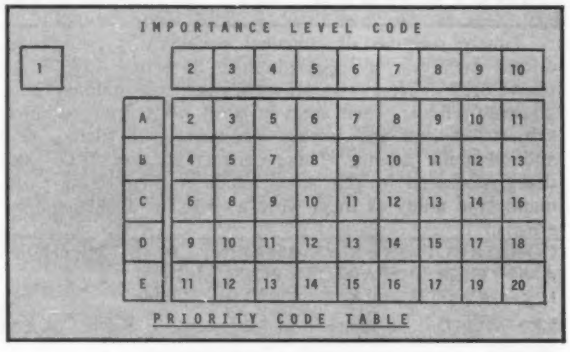
All work that is classified as an emergency is automatically assigned the highest possible priority—Priority One. All other work has priorities 2 through 20.

Experience at Point Mugu indicates that all maintenance and repair work requests normally have the following priority dispersions:

| | |
|---|---|
| Emergency Work Priorities | — 1% |
| Work Priorities 2-7 | — 19% |
| Work Priorities 8-14 | — 60% |
| Work Priorities 15-20 | — 20% |

The Selector is a workable tool for planning personnel. They no longer have to assign priorities by guesswork. It is an excellent planning technique for getting the job done.




## IMPORTANCE LEVEL CODE

*General Premise:* Fire, safety, security, mission, preventive, corrective, morale, and welfare work classification encompass such real property as land, buildings, roads, utilities, and industrial equipment.

a. *Emergency:* Work that requires *immediate* action to accomplish singly or any combination of the following:

(a) Prevent loss or damage to Government property.
(b) Restore essential services that have been disrupted by a breakdown of utilities.
(c) Eliminate hazards to personnel or equipment.

b. *High Maintenance and/or Repair Deficiency*

(a) Has a *significant* adverse effect on the safety, health, or well being of personnel, or
(b) Has a *significant* adverse effect on external or internal security of plant property, or

(c) Has a *significant* adverse effect on the mission of the facility or equipment to perform function for which intended, or

(d) Has a *significant* adverse preventive effect and if not corrected promptly will result in rapid deterioration necessitating major repairs or replacements, or

(e) Has a *significant* adverse effect on the morale of personnel and if not corrected promptly will promote decreased efficiency and/or production.

c. *Reasonable Maintenance and/or Repair Deficiency*

(a) Has a *limited* adverse effect on the safety, health, or well being of personnel, or

(b) Has a *limited* adverse effect on external or internal security of plant property, or

(c) Has a *limited* adverse effect on the mission of the facility or equipment to perform function for which intended, or

(d) Has a *limited* adverse preventive effect and if not corrected will result in harmful deterioration necessitating major repairs or replacements, or

(e) Has a *limited* adverse effect on the morale of personnel and if not corrected promptly will promote decreased efficiency and/or production.

d. *Low Maintenance and/or Repair Deficiency*

(a) Has *minor* adverse effect on the safety, health, or well being of personnel, or

(b) Has *minor* adverse effect on external or internal security of plant property, or

(c) Has *minor* adverse effect on the mission of the facility or equipment to perform function for which intended, or

(d) Has *minor* adverse preventive effect, or

(e) Has *minor* adverse effect on the morale of personnel.

## WORK CLASSIFICATION

a. Fire, safety, security: Self explanatory.

b. Mission: Primary purpose, function, or use of the real property and/or primary purpose, function, or business of the occupying or controlling organization of the real property.

c. Preventive and/or Corrective: Action needed in order that the real property involved may be effectively utilized for its designated purpose, function, use, or business.

d. Morale and/or Welfare: Insure and/or enhance the personnel's mental state and/or working conditions and standards.

# A Voice In The Night

By LCDR CHARLES S. PRAHL, CEC, USN
*CECOS*
*P.E., Pa.*

I worry a lot. Lately I've been worrying about the CEC. Worrying because I'm picking up signals that we're not meeting our recruiting goals for getting new officers into the Corps.

Maybe it's because of this concern that this little voice has recently come a-whispering to me late in the night.

"Hey, bozo," it began last night. "Listen up 'cause you've got problems."

"Me?" I replied groggily.

"Not you, dummy," came the voice. "The whole Swivel Engineer Corps."

"That's Civil Engineer Corps," I alertly corrected.

"Civil, Schnivel; big deal," it said. "The point is, you all are not getting enough people to try on your business for size."

"But it's not our fault," I protested. "We could be doing fine if it weren't for those recruiting offices. Whenever they see an engineer, all they can think of is 'Nuclear Power Program, Nuclear Power Program.' It really has got 'em psyched. But we're fighting back," I said excitedly! "We've got OIS now, and the College Program, and slide shows, and all kinds of neat things going for us."

"Irrelevant," said the little voice. "They're not really working."

"True," I confessed. "But, if we go down, we'll go down with all guns firing," I said proudly.

"That's terrifico."

"O.K., smarty cats," I said smugly, "if you've got a better idea, let's hear it."

"Use your strengths," said my friend.

"Could you please explain that in a bit more detail?" I asked.

"O.K.," it said. "What is one of the greatest strengths of the Swivel, er, Civil Engineer Corps?"

"Me!" I replied confidently.

"Yeacchh," the voice gasped. "Maybe I better give you a hint—how 'bout your reserve program?"

"No comprendo, amigo," I replied.

"Listen," came the voice, its tone rising, "for its size, the CEC has a really large reserve organization. They're unique not simply because of their size but also because of the way they look back at their active duty years. Nearly all remembered that period with a great deal of pride and sense of accomplishment. Though they elected to leave active service, they usually left with fond memories of a super professional experience. Use those guys to dispense recruiting information."

"Check," I replied. "We're going to get the reserves to give up their nights and weekends to recruit active duty candidates. Fat chance they'll be enthused about that."

"No, Yo-Yo," it answered sharply. "Recruiting wouldn't be an additional job, it'd be their primary reserve duty. Instead of going to drill weekends, they could be required to pitch the Corps in their geographical area. Further, they could schedule their two weeks of active duty to coincide with the college recruiting season. A handpicked group of 15-20 officers could cover most major population centers, and they'd be working on their own turf using long cultivated contacts."

"But it doesn't make sense," I said. "How can we use a guy that got out to encourage people to come in?"

"C'mon, man," he said. "How many of you guys put on crossed bananas with the idea of staying in 20-30 years? Most intend to do just what that reserve has done: try it on for a few years, get some experience, then probably bug out. Why not get someone that actually went such a route to talk to these guys? Heck, he'd have more credibility in a recruiting atmosphere than a gung-ho lifer up there in service dress blue. Face it, you need most of your officers to get out, anyway, to have a rank pyramid with a decent promotion opportunity."

"Say, this idea might work. Has anyone else tried it?"

"Well, my buddies tell me the Army uses reserve officers to recruit candidates for tundra city—I mean West Point."

"How does it work for them?" I asked.

"Sorry," he said. "I'm just an idea man. Working out all the details isn't in my P.D."

SPEAKING FROM TOPSIDE

# *People Assets or*

In our everyday lives, all of us are impacted and influenced by people, places and things. I would like to discuss only one of these factors. . . *people.*

The Naval Facilities Engineering Command employs approximately 20,000 people; some wear uniforms and some do not. We all have something very much in common in that we share an especially important organizational objective. That objective is to provide the best possible facilities support that we can to the operating forces of the Navy. . . the ships, submarines and the aircraft.

I believe that our past successes in achieving this goal can be primarily credited to the competence, quality and dedication of our people. On the other hand, many of our past failures are attributable to the poor performance of our people. NAVFAC like any large people organization has its better performers as well as some poor performers. As managers, it is our job to strive to maximize our successes and minimize our failures. I suggest that one of the best methods for doing this is to follow a personnel strategy which hires and retains the best people and does not hire and retain the poor performers.

It is recognized that this is much easier said than done. A common complaint is that the complexities and bureaucratic red tape associated with our military and civilian personnel procedures prevent us from following this strategy. We have all read of proposals which will streamline the personnel systems to make our jobs easier and less complicated. But don't hold your breath. We will always read of proposals which will make our jobs easier! To be successful we must be effective at our jobs under today's rules and not wait for tomorrow's promised changes. We live in the present and must work within the existing systems. In the personnel arena, I believe that we must all become better acquainted with the rules and procedures and utilize them. They can work if we learn the system, seek proper advice and abide by the rules. Therefore, rather than bemoan recognized systemic impediments, I would like to concentrate on what *can* be done.

In the hiring process, we must settle for only the best. The needs, emotions and politics of the moment must not force a hurried decision to be regretted later. Our competence and professionalism of organization today is largely a result of our personnel decisions over the past twenty years. Our ability to deal with the engineering demands and problems of the 1990's

# *Are Our Liabilities*

.s being determined today by how well we incorporate a vision of the future in present hiring actions. This importance placed on personnel makes it imperative that, no matter how busy, we take the time to thoughtfully consider every job action.

Once they are hired we must work to retain our best performers. In this respect, I encourage supervisors and employees to communicate and work together to increase job satisfaction. Supervisors should praise their employees in public and also constructively evaluate their weaknesses in private. Both are equally necessary management functions. Finally, make the merit promotion system work. To retain and encourage our best employees, outstanding effort should be rewarded. To fill vacancies, it is management's responsibility to select the best and not necessarily the favorite applicant. This is a fundamental prerequisite to retaining confidence that the system does work.

Poor performance is a more difficult situation to handle. It is an area that we hesitate to discuss or even to admit that it exists. However, poor performers are evident in most organizations. We as managers are paid to recognize them and to deal with their shortcomings. Seek out the root of the poor performance and work with the employee. If improvement cannot be obtained, management action should be taken. While some managers might shrink at the complexities involved, poor performers *can* be replaced. Eliminating poor performers is just as fundamental to our success as hiring and retaining good employees.

The many accomplishments that have been attained in NAVFAC have been due in great part to the fine performance of our personnel. However, I am sure that we recognize that our organizational performance, although good, can also be better. To attain our best collective performance we must learn to more effectively utilize the personnel systems and apply procedures under the existing rules.

C.C. Heid,
Rear Admiral, CEC, USN,
Commander, Atlantic Division
Naval Facilities
Engineering Command

# *An invitation to young graduate engineers to join the young professionals of the U.S. Navy*

# CIVIL ENGINEER CORPS

Construction and maintenance of the Navy's shore and support installations is just one of the responsibilities of the engineer managers of the Navy's Civil Engineer Corps. And qualification is not limited to the civil engineering discipline, as the Corps requires graduate engineers of mechanical, chemical, electrical, industrial and construction disciplines and architecture too! As a commissioned officer of the U.S. Navy the young engineer is offered greater opportunity to develop quickly a professional career with the added potentialities of an exciting overseas assignment, professional registration and graduate studies! The young officer may be assigned to construction contract administration, public works management or with a Naval Mobile Construction Battalion, the historic Seabees, plus many individual and unique positions.

Engineering students and counselors are invited to explore the multifaceted world of the Navy's Civil Engineer Corps by contacting their local Navy Recruiter for specific details. An informal visit with a Civil Engineer Corps officer to discuss the personal and professional benefits of a Navy career can be arranged by the same Navy recruiter or by calling or writing the Naval Facilities Engineering Command, (ATTN Code 09MA1), 200 Stovall Street, Alexandria, Va., 22332 Telephone: (202) 695-3635.

Call toll-free 800-841-8000 now if you desire instant information from the Naval Recruiting Command. If you're a good student, and want to be a better engineer, the chances are you'll do best by investigating the Civil Engineer Corps of the U.S. Navy.

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